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No. 19

ORE AGAIN CLEANED UP.

OUTPUT OF 18,500,000 TONS FROM THE MINES LAST YEAR HAS BEEN WIPED OUT—
ONLY 1,720,656 TONS ON LAKE ERIE DOCKS, THE SMALLEST STOCKS SINCE 1892.

Again the season of navigation on the great lakes has opened with stocks of ore at all Lake Erie ports practically cleaned up. On all the docks there is just 1,720,656 gross tons of ore, which is a small item, as much of it is probably of an inferior kind that has been accumulating for years. This is less ore than the docks have contained in any spring since 1892. They were well cleaned up a year ago but the surplus is lighter now by about 350,000 tons. The reports from the dock managers, supplemented by conservative estimates as to the consumption of ore that went to the Federal Steel Co. and other interests on Lake Michigan, also show that the entire consumption of the Lake Superior product during the year ended with the first of the present month was somewhat in excess of the output of 18,500,000 tons made by the mines in the year 1899. Thus another new year is begun in the ore business with the product of the previous year entirely wiped out.

Reports from all the dock managers to the Marine Review show that the stocks on dock May 1 aggregated only 1,720,656 tons (gross tons in all cases), against 2,073,254 tons on the same date in 1899 and 3,167,915 tons in 1898. The extent to which the furnaces have been using the ore is best shown by shipments from Lake Erie docks for the full year ended May 1, which aggregated 15,882,881 tons, against 12,122,982 tons during the year ended May 1, 1899, 10,209,488 tons during the year ended May 1, 1898, and 6,719,633 tons during the year ended May 1, 1897.

At the close of navigation Dec. 1, 1899, the stocks on Lake Erie docks amounted to 5,530,283 tons. If we deduct from this 1,720,656 tons, the amount now on dock, we find that shipments to furnaces from Lake Erie ports during the winter period (Dec. 1 to May 1) amounted to 3,809,627 tons, which, added to 12,073,254 tons, the amount shipped to furnaces during the season of navigation in 1899, gives 15,882,881 tons as the entire consumption of ore from Lake Erie docks during the year ended May 1, 1900. The following tables give full details of stocks and shipments to furnaces for several years past:

IRON ORE ON LAKE ERIE DOCKS—GROSS TONS.

Ports.	Opening of Navigation.			Close of Navigation.		
	May 1, 1900.	May 1, 1899.	May 1, 1898.	Dec. 1, 1899.	Dec. 1, 1898.	Dec. 1, 1897.
Toledo.....	52,616	22,915	71,726	186,422	146,568	194,644
Sandusky.....	4,300	7,086	48,800	23,184	48,510	84,786
Huron.....	48,412	82,055	143,170	164,480	139,982	230,029
Lorain.....	126,212	168,646	158,797	337,822	324,034	317,509
Cleveland.....	386,291	472,946	853,776	1,200,806	1,175,970	1,478,355
Fairport.....	282,298	289,417	501,592	692,147	719,794	825,312
Ashtabula.....	678,789	855,691	1,031,441	1,902,598	1,732,671	1,835,694
Conneaut.....	8,649	6,115	69,047	468,808	288,101	360,895
Erie.....	97,894	96,626	236,485	361,335	439,167	484,871
Buffalo.....	35,195	72,757	53,081	192,681	121,620	111,660
Total.....	1,720,656	2,073,254	3,167,915	5,530,283	5,136,407	5,923,755

IRON ORE ON LAKE ERIE DOCKS, MAY 1 OF EACH YEAR FOR TEN YEARS PAST.

Year.	Gross tons.	Year.	Gross tons.
1900.....	1,720,656	1895.....	2,642,890
1899.....	2,073,254	1894.....	2,588,370
1898.....	3,167,915	1893.....	2,095,797
1897.....	3,256,497	1892.....	1,537,188
1896.....	1,949,698	1891.....	2,662,223

IRON ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACES, FULL YEARS.

Year ending	Gross tons.	Year ending	Gross tons.
May 1, 1900.....	15,882,881	May 1, 1897.....	6,719,633
May 1, 1899.....	12,122,982	May 1, 1896.....	8,805,510
May 1, 1898.....	10,209,488	May 1, 1895.....	6,296,215

IRON ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACES, DURING WINTER PERIOD, DEC. 1 TO MAY 1.

Winter of	Gross tons.	Winter of	Gross tons.
1899-00.....	3,809,627	1896-97.....	1,698,487
1898-99.....	3,063,153	1895-96.....	2,466,014
1897-98.....	2,755,840	1894-95.....	2,191,267

LAKE FREIGHT SITUATION.

It is encouraging to note from statistics of iron ore on Lake Erie docks that the 1899 output of 18,500,000 tons of ore from the Lake Superior region has been entirely used up within the year ended May 1, but it must be admitted, in view of present dullness as to orders in the iron trade for the last half of the year, that the future is not so certain. The movement of grain, lumber and other lake products has not been up to expectations. With navigation open ten days or two weeks ahead of favorable conditions for the movement of ore from the mines, "wild" rates have settled at 80 cents from Escanaba, 90 cents from Marquette and \$1.05 from the head of the lakes, which is a uniform reduction of 20 cents a ton compared with the contract rates. It is more than probable that by June 1 the ore shipments will be half a million tons ahead of the movement on the same date a year ago, as the gain due to an earlier opening of navigation will be supplemented by the increase of shipments that was planned for this year. The freight situation thus far is therefore decidedly against what was expected for the vessels, and it is fortunate, from the vessel owner's standpoint, that contracts at the high rates of last fall extend to the great bulk of the fleet.

CIRCULAR RELATIVE TO THE NEW BATTLESHIPS.

Secretary Long on Tuesday approved the circular prepared by the naval board on construction containing the specifications for the battleships Pennsylvania, New Jersey and Georgia. Copies of the circular will be sent to all ship building firms, which may contemplate bidding on the construction of the vessels, but the contracts cannot be made with the successful bidders until the armor-plate controversy has been settled. The circular contains the alternative stipulation concerning the arrangement and character of the armament which was decided upon owing to the strong pressure in favor of superimposed turrets for the vessels of the Pennsylvania class. While a majority of the board rejected the superimposed turrets, it felt itself obliged to show some deference to the opinion of men so prominent in the navy as Rear Admiral Sampson, Rear Admiral Bradford and Capt. Folger, who believe that the superimposed turrets should be adopted. It therefore agreed to a specification providing that the department should have the right to substitute double-deck turret structures for the arrangement adopted at any time within six months from the date of the contract. The provision to that effect is as follows:

"The department will reserve the right to change, within a period of six months after date of the contract, the number and caliber of the guns, the arrangement of the battery and turrets, including the adoption of the superimposed turrets and the thickness and distribution of the armor."

A statement prepared in the office of the secretary of the navy describes the chief characteristics of the three battleships as approved. They will have twin screws. The engines will be of the vertical twin-screw four-cylinder, triple-expansion type, of a combined indicated horse power of 19,000. The steam pressure will be 250 pounds. There will be twenty-four boilers of the straight water tube type, placed in six watertight compartments. The general dimensions, etc., of the vessels are: Length on load water line, 435 feet breadth, extreme, at load water line, 76 feet; trial displacement, about 14,650 tons; mean draught at trial displacement, about 24 feet; greatest draught full load, about 26 feet; total coal bunker capacity, 1,900 tons; coal carried on trial, 900; feed water carried on trial, 66 tons; speed not less than 19 knots.

The armament will be as follows: Main battery—Four 12-inch breech-loading rifles of forty calibers in length, eight 8-inch breech-loading rifles of forty-five calibers in length, twelve 6-inch breech-loading rapid-fire rifles of fifty calibers in length. Second battery—Twelve 3-inch breech-loading rifles (14-pounders); twelve 3-pounders, four 1-pounders, single shot; two 3-inch field guns, two gatling guns, thirty automatic guns. The main battery will be mounted as follows: Four 12-inch guns in pairs in two electrically controlled, balanced, elliptical turrets, having inclined port plates; such turrets being on the line of the keel, one forward and one aft, having an arc of fire of 270 degrees. Eight 8-inch guns in pairs in four electrically controlled balanced turrets, one on each beam near the forward end of the superstructure and one on each beam near the after end of the superstructure, having an arc of fire from right ahead and astern to not less than 55 degrees forward and abaft the beam. On the main or gun deck twelve 6-inch guns will be mounted in broadside, six on each side, having an arc of fire of 110 degrees, that is 55 degrees forward of and 55 degrees abaft the beam.

The armored protection will be as follows: There will be a complete water line belt 8 feet in width. This belt will be of maximum thickness for a distance of about 190 feet abreast the engines and boilers, that is 11 inches thick at its upper edge and maintaining this thickness downward for a distance of 5 feet, from which point it will taper to 8 inches at its lower edge. This belt will be completed to the bow and stern as follows: For a distance of about 45 feet forward and abaft the heavy belt above described, the plates will be 9 inches in thickness at the lower edge. The next course of plates, forward and aft for a distance of about 20 feet, will be 6 inches in thickness at the upper edge, tapering to 4½ inches in thickness at the lower edge. The next course of plates, forward and aft for a distance of about 20 feet will be 5 inches in thickness at the upper edge, tapering uniformly to 4 inches at the lower edge. The belt will be completed to the bow and stern with plates of uniform thickness of 4 inches. Above the main belt, and covering the central portion of the hull for a distance of about 245 feet, the ship's sides will be protected by armor of a uniform thickness of 6 inches, extending up to the upper deck, this upper and lower casement side armor being joined to the barbettes of the after 12-inch gun turret by athwartship armor of 6 inches in thickness, and connected forward by inclined armor 6 inches in thickness, thus forming a central casemate or redoubt which will contain twelve 6-inch guns.

All 14-pounder guns will be protected by 2-inch plates of sufficient area to form efficient shields to the crews working them. The barbettes for the turrets for the 12-inch guns will be 10 inches in thickness, except where they are inclosed in the casemate, where the thickness will be reduced to 6 inches. The turrets for the 12-inch guns will be 10 inches in thickness, except the port plates, which will be 11 inches in thickness. The tops will be 3 inches in thickness. The armor for the 8-inch gun turrets will be 6 inches thick, except the port plates, which will be 6½ inches thick. The barbettes for these turrets will be 6 inches in thickness, and the tops 1½ inches thick. The conning tower and its shield will be 9 inches thick. Its tube will be 6 inches in thickness and its floor 2 inches. The signal tower will be 5 inches in thickness.

Lake shipping interests are well represented in the new board of directors of the Wheeling & Lake Erie Railroad Co., which now has headquarters in Cleveland and controls what was formerly the Cleveland, Canton & Southern Ry. The new directors are: Myron T. Herrick, Cleveland; D. R. Hanna, of M. A. Hanna & Co., Cleveland; E. W. Oglebay, of Oglebay, Norton & Co., Cleveland; Geo. A. Garretson, Cleveland; H. P. McIntosh, Cleveland; W. G. Mather, president Cleveland-Cliffs Iron Co., and American Trust Co., Cleveland; F. G. Hearne, vice-president National Tube Co., Pittsburg; C. M. Spitzer, Toledo, O.

SIX VERY LARGE STEAMERS.

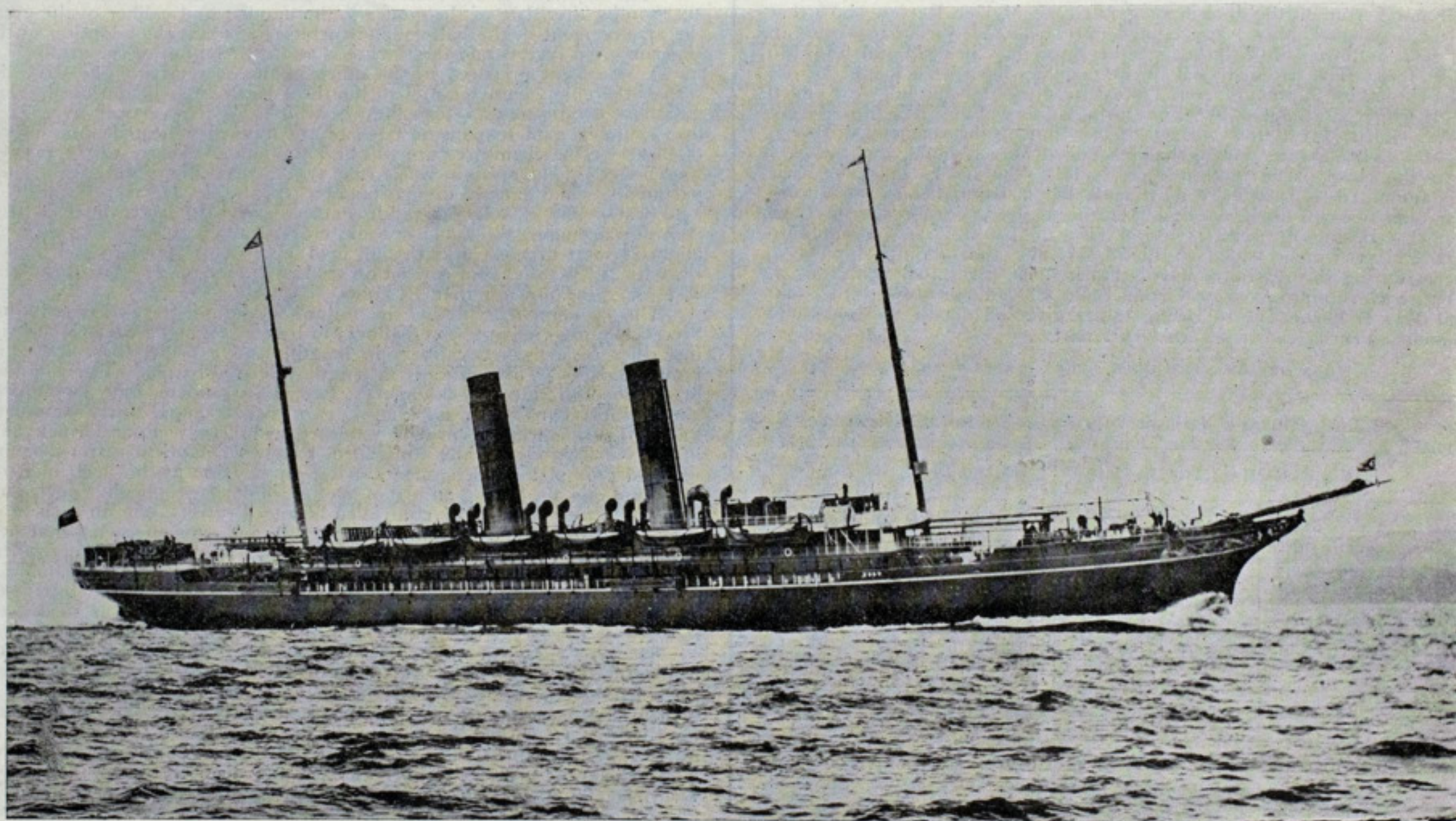
Six large cargo and passenger steamers are now building in America, all of which are larger than the St. Louis and St. Paul, built four years ago. The two Pacific mail steamers building at the yard of the Newport News Ship Building & Dry Dock Co., Newport News, Va., are each 550 feet long, 63 feet beam and 40 feet deep. They will have a displacement of 19,000 tons and their building numeral is 73,000. The two large International liners building at the works of the Cramps, Philadelphia, are somewhat larger than the Pacific Mail ships, being 560 feet long, 60 feet beam and 42 feet deep. They will each have a displacement of 21,000 tons and their building numeral is 74,000, being a trifle larger than the Newport News built vessels. The two mammoth Pacific steamers just begun by the Eastern Ship Building Co., New London, Conn., for James J. Hill of the Great Northern Railroad, are 625 feet long, 73 feet beam and 54 feet deep to the strength deck. These vessels will have a displacement of 34,000 tons and their building numeral is over 100,000. They are, therefore, 50 per cent. larger than the Pacific Mail and International liners building at Philadelphia and Newport News.

It may be interesting to quote as a comparison some figures giving the displacement of various well known trans-Atlantic cargo and passenger steamships. For instance, the Campania, Cymric and Friedrich der Grosse have each a displacement of 17,000 tons. The Kaiser Wilhelm der Grosse 19,600 tons and the Pennsylvania and Deutschland have each a displacement of 23,000 tons. The large Hill steamers have, therefore, a displacement of over 10,000 tons more than the largest vessels floating today.

The Eastern Ship Building Co. is now actively engaged in preparing the ground for the construction of the two Hill Pacific liners. The buildings are being erected and material is being ordered for the ships.

when required. The general outfit, including steam windlass and capstan forward, steam capstan aft, fire and life-saving apparatus, water tanks for trimming purposes, steam steering gear, steam-heating and waterworks system, artificial ventilation and electric light plant of 1,000 lights, will all be of the latest and most approved design.

With the exception of a limited space for a small amount of express freight, and the space necessary for crew and propelling purposes, the entire steamer will be given up to passenger accommodation. On the main deck aft will be the smoking and correspondence rooms, barber shop, bar, entrance hall, purser's office and baggage room. In the middle will be the engines and boilers and a portion of the crew space, and forward the dining room and pantries, extending out the full width of the sides, and lit from both sides with a raised glass canopy in the ceiling. This position of the dining room is admirably adapted for purposes of observation, as well as for convenience with the kitchen below. It will cause a large gain in passenger accommodation, as on most steamers this space is devoted to freight. With the exception of the open seating space at the bow sides and stern, the saloons and staterooms will occupy the whole of the first and second decks above the main deck, arranged in the form usual on the large inland steamers. An exceptional feature, however, will be a large, handsome skylight in the roof, immediately over the glass canopy in the ceiling of the dining room. There will be 165 staterooms and eight parlor rooms with bath rooms attached. The third deck, above the main deck, will have the pilot house forward, and behind it rooms for the captain, mates and wheelmen; all the rest of this deck will be a spacious promenade for passengers. Following the principle adopted in the case of the steamer Toronto, the ornamental work will be of original design and finish throughout.



One of the Castle Liners.

A large staff of competent draughtsmen are at work upon the plans of the vessels. The chief hull draughtsman is Archibald M. Main and the chief engine draughtsman is Gordon B. West. Both of these gentlemen have had great and varied experience. It is said that the Carnegie Steel Co. will furnish all the material used in the construction of these large vessels, and the quantity is stated at over 20,000 tons.

NEW STEAMER KINGSTON.

The steamer Kingston which is to be built by the Bertram Engine Works Co. of Toronto for the Richelieu & Ontario Navigation Co., will be similar in character to the side-wheel steamer Toronto, built last year for the same company, but will be somewhat longer and with greater accommodations. She will run on alternate days with the Toronto, on the route between Toronto and Prescott, and will be ready for June, 1901. Her length over all will be 290 feet; breadth of hull, 36 feet; depth of hull, 14 feet; draught of water, 8½ feet. The hull will be of open hearth steel with four water-tight bulkheads; the main deck also will be wholly of steel. The hull will have considerable dead rise on the bottom, the general shape being based on that of the Toronto. The increased length will enable the lines to be somewhat easier and finer than those of the Toronto.

The boilers will be four in number, of Scotch pattern, 11 feet in diameter and 11½ feet long. Each boiler will have two furnaces, 40 inches in diameter, fitted with hot draft. The engine will be inclined triple expansion, with three cranks and three cylinders, respectively 28, 44 and 74 inches in diameter, and 6 feet stroke, with a working pressure of 175 pounds steam per square inch, capable of making forty revolutions, with feathering paddle wheels 22 feet in diameter and curved steel buckets 10 feet 4 inches long and 3½ feet wide. The average speed of the vessel in regular service will be 17 miles an hour, with capacity for 20 miles

TRIAL TRIP OF THE WARIAG.

The cruiser Wariag, building at Cramps for the Russian government, will be given a trial in a few days. The vessel is required by the contract to make 23 knots an hour. The Wariag is a protected cruiser modeled upon the lines of the Armstrong type of English cruiser. She is 416 feet long on the water line, has a maximum beam of 52 feet and draws when ready for sea between 19½ feet and 20 feet of water. Her offensive qualities consist of three batteries, the main battery including twelve long, rapid-fire 6-inch rifles and the secondary composed of twelve 3-inch rapid-fire guns with a mixed auxiliary force of two 2.5-inch Baranovski, two 14-inch Maxim and six 1.8-inch Canet rapid-fire guns. The Baranovski guns fire a 5.6-pound shot, the Maxims a 1.1-pound shot and the Canet pieces discharge 1.5-pound projectiles. The ship will be propelled by two sets of powerful triple-expansion engines fed by thirty-two water tube boilers.

LARGE NEW DRY DOCK.

An extensive graving dock has been erected at Shanghai by the Shanghai Engineering, Ship Building & Docking Co. Vessels of 12,000 tons may be accommodated. The length on the blocks is 465 feet to the inner chase and 526 feet to the outer caisson, the total length on top being 571 feet. The width at entrance at the bottom is 64 feet and at the top 80 feet, while the width in the dock is 54 feet at bottom and 128 feet at the top, and the depth of water on the sill from 23 to 24 feet at ordinary spring tides. The caisson, which serves both chases, is of wood with trolley lines laid over the deck. The water in the dock can be pumped out in 2½ hours by two centrifugal pumps of 22 and 27 inches diameter respectively, driven by an ordinary compound engine. A slipway to take a vessel of 350 tons weight, operated by a steam winch and intended also for hoisting at the shearlegs, is being constructed.

SHIP BUILDING BOOM.

BRITISH YARDS THAT HAVE BEEN WORKED TO THEIR UTMOST CAPACITY FOR MORE THAN TWO YEARS ARE GETTING SHORT OF ORDERS—HIGH PRICES OF MATERIAL ONE OF THE CAUSES.

FROM ENGINEERING, LONDON.

Is the boom in ship building collapsing? That is a question frequently being asked in all our great industrial centers and on 'change, for builders have recently made no secret of the paucity of "inquiries," and still more of the difficulty of securing orders. It is true that many of the larger firms prefer reticence on this subject, for employers and employed continue unfortunately to wage warfare from the industrial point of view, so that knowledge of new work often proves an incentive to the men to enforce the law of supply and demand. Whether the employers are able to preserve this secrecy is quite another affair; but the point has been urged, at least by the optimist, as a reason for not accepting the testimony of the ship builder. We have now at hand, however, the official return by Lloyd's Registry of Shipping, which is in a position to know the actual facts of the case. Their report indicates that the work actually on hand shows a decrease as compared with three months ago of 46,000 tons; but the falling off had set in early in the autumn, and the total now is 145,000 tons, or about 10 per cent. less than the highest point reached, which was in December of 1898.

This decrease is not at first sight serious, when taken in conjunction with the fact that it is upon abnormal conditions. The figures of greatest significance, however, are those indicating the amount of work commenced recently. Last year merchant vessels were launched at a rate which made the average output 360,000 tons per quarter. In the three months just ended the vessels commenced only totalled 245,370 tons, whereas fifteen months ago they totalled 430,000 tons. From the return it is clear that new keels are not taking the place of all the vessels launched. It may be taken that nine months is a fair average period now for the preparation of ordinary-sized vessels for launching, and if the

	Total under construc- tion.	Tons.	Vessels com- menced.	Tons.	Per cent. of total.
January, 1899.....	584	1,401,087	190	436,473	31
April, 1899.....	597	1,385,715	179	347,525	25
July, 1899.....	568	1,386,367	175	346,449	25
October, 1899.....	558	1,347,549	174	307,386	22.8
January, 1900.....	538	1,306,751	175	339,764	26
April, 1900.....	554	1,260,422	160	245,370	19.4

vessels launched within that period are compared with those commenced it is shown that the work now is less by 81,000 tons than in September last. The actual state of the case, too, is made even worse than the figures indicate by the fact that much more of the work is now in an advanced state of construction, for the vessels reported as "commenced" form a steadily decreasing proportion of the total. It will thus be seen that eighteen months ago the volume of work was not only large, but that a great proportion—about a third of it—was in the early stages, and represented a much higher labor value. Now barely a fifth of the greatly reduced total is new work, and although the figures at the beginning of the year show a slight recovery, this is due to the exceptional cause of new tonnage being then ordered to take the place as soon as possible of vessels chartered for the conveyance of the army corps to Africa. This sudden fillip was not only momentary, but will have an influence in the opposite direction when the troopships are relieved from special duty.

The situation now is partly due to the difficulty of getting anything like early delivery of ships and partly to the high prices charged, both for material and labor. Our metal price diagram has from month to month recorded the steady upward movement of most metals, notably steel plates and iron, and there is the further fact that structural iron—girders and the like—commands £21 to £22 per ton, and is even then difficult to get for early delivery. Ship owners therefore pause, and that wisely, before placing at a high price an order which may not be fulfilled until a period when lower contract rates prevail. And once this view gets abroad—and it is being repeated by many able to judge—the collapse in the demand for new ships must be pronounced. It would almost appear as if this was the case now. Freights, it is true, are good; but it is difficult to be certain that they will continue at a level sufficient to meet the larger capital charges consequent upon the high contract rates now demanded. There is another point of importance in connection with the future, and that has reference to large ships. At the recent meeting of the Institution of Naval Architects it was made clear that there were limitations to the use of these great liners. Professor Biles pointed out that after a certain point was reached, economy in carrying was dependent upon increased draught, and that the class, or cubic capacity, of the freight, was a further element; while Mr. West, an experienced Liverpool naval constructor, took the view that the very large steamships could only find their profitable venue on the Atlantic. The demand for new ships of this service, if this be true, must sooner or later be met, with a material reduction in the ship building output. There is no such reduced demand as yet, for seventeen vessels are now building which exceed 10,000 tons; but there is a decrease in the number of vessels between 6,000 and 10,000 tons in course of construction.

It is worth noting that notwithstanding her activity at home Germany has in course of construction in this country eighteen vessels of 84,011 tons, while Austria-Hungary is having built thirteen of 37,189 tons, and Holland six vessels of 29,580 tons. The foreign-owned tonnage makes less than 18 per cent. of the total merchant work under construction. This does not include foreign warship work, which includes twenty-eight vessels of 68,580 tons, and here again there is a big decrease, for a year ago we had in British yards thirty-one foreign warships totalling 109,375 tons, while two years ago the total was nearly double what it now is. Our own warship work, however, more than makes up for this difference, although here there is great difficulty in arriving at a fair conception of the labor value of the tonnage, because everything is included except vessels not actually officially tried. It would be easy to indicate several

vessels included upon which very little work remains to be done, but without allowing for this we have under construction the following vessels:

	Tons.
554 merchant vessels of.....	1,260,422
53 British warships of.....	385,530
28 foreign warships of.....	68,580
Total	1,714,532

A year ago the total was 1,819,780 tons, so that there is a decrease of 105,000 tons, notwithstanding that British warships account for 61,000 tons more now than a year ago.

STEAMSHIP BIGGER THAN THE OCEANIC.

The North German Lloyd line has just placed with the Vulcan Ship Building Co. of Stettin an order for a vessel which is to maintain an average speed of 25 knots an hour. In the contract it is further stipulated that the vessel shall have a length of 752 feet and that her engines are to develop 45,000 horse power. Thus, in speed, horse power and size this new leviathan will exceed all the others now afloat or building. The nearest approach to her in the way of speed is the Hamburg-American steamship Deutschland, which is soon to be placed in service in the transatlantic route, and which is guaranteed by her builders to have a sustained sea speed of not less than 23 knots an hour.

But the engines which are emplaced in the Deutschland have an indicated horse power of only 33,000, as against 45,000 in the new vessel. The horse power of the Deutschland, by the way, far exceeds that of any other vessel now afloat. In regard to size, this new product of the German shipwright will far outclass anything now afloat. The Oceanic of the White Star line now holds the distinction of being the biggest ship that was ever launched. But her length over all is 704 feet, against the new vessel's 752 feet.

With all her great size the Oceanic has no pretensions in the way of speed. She is content to make her way across the Atlantic in a week's time. The Deutschland, which is much faster, but of less size, hopes to accomplish the transatlantic run within five days. The new ship will, if her builders fulfill their contract, steam into port in the near future with all sorts of broken records trailing behind her—that for greatest speed in an ocean liner and that for greatest length and beam and depth being among them.

The contract calls for the vessel's completion in 1901. Before she is completed it is possible that the strong rivalry which exists between the two big German lines, the Hamburg-American and the North German Lloyd, may lead to the building of another still bigger and faster. The construction of the record-breaking Kaiser Wilhelm der Grosse of the North German Lloyd line brought about the building of the Deutschland by the Hamburg-American company. The prospect that the Deutschland will outdo the Kaiser Wilhelm der Grosse has in turn led the North German Lloyd to contract for a vessel that will outclass her. The Cunard line, whose Lucania holds the New York-Queenstown record, may be forced to greater exertions. The best time made by the Lucania to the westward is five days, 7 hours and 23 minutes. If the new German racer goes over the same route and lives up to her contract in the way of speed, she will accomplish the run in 4 days and 21 hours.

CAPT. FORSYTH ON SHEATHED SHIPS.

Rear Admiral Philip Hiehorn, chief of the bureau of construction and repair, has received the following letter from the Asiatic station supporting him in his contention for sheathed ships:

U. S. FLAGSHIP BROOKLYN,
Asiatic Station,
Cavite, P. I., March 23, 1900.

My Dear Hiehorn: I have read with great interest the items in newspapers regarding the question of sheathed ships. I regret exceedingly to see that you seem to be left in the minority; but I beg you not to give up the fight. The true interests of our navy require that we should have sheathed ships; not only our battleships, but armored cruisers and smaller cruisers as well. From the old days at League Island, when we used to talk this thing over, and I as an ordinary, practical seaman, believed that you were on the right track for us, up to the present, I have never seen good cause to change my opinion.

If you could know the infinite worry it has been to me as chief of staff of this fleet and to our commander-in-chief to keep the bottoms of our ships clean; the constant working and figuring about when we could spare a ship to let her dock; the distance from our scene of operations that we have had to send them; the cavalier way in which we have been treated by docks and docking companies, who knew they held us in the hollow of their hands, I feel that it would strengthen you in your determination to fight for "sheathed ships." I believe if you could get to Rear Admiral Watson you would obtain the strongest endorsement of your ideas and desires. After all, the great objection is fear of leaks and chemical or galvanic action between steel hull and copper. I believe that that is only a mechanical problem that can be solved, if it is not already solved, by the American mechanic. Look at the Wheeling, the Princeton and the Marietta out here. They are simply worth any six of the other ships, because we don't have to worry and bother about docking them at stated intervals. I am in sympathy with you in this because I honestly believe it is best for us, and I only wish I had a lot of influence to throw for you in this struggle.

JAMES M. FORSYTH, Captain, U. S. Navy.

VESSELS EQUIPPED WITH BELLEVILLE BOILERS.

The list of vessels equipped with the Belleville water tube boilers is growing steadily. There are forty in the British navy, fifty-seven in the French navy, thirty in the Russian navy, nine in the Japanese navy and several in the Spanish, Italian, Chilean and Argentine Republic navies. Le Figaro speaks entertainingly of a recent trip of the Gaulois and the Charlemagne, equipped with Belleville boilers, from Brest to Marseilles. The voyage was remarkable from many points of view. At a sustained speed of about 15 knots the vessels behaved in such a manner as to win the encomiums of those who managed them. The machinery worked with the utmost precision and not a hitch occurred anywhere.

MODEL ELECTRICAL EQUIPMENT.

A NEW PLANT TO SUPPLY LIGHT AND POWER IS SUBSTITUTED FOR THE FORMER STEAM DRIVE AT THE WORKS OF THE CLEVELAND TWIST DRILL CO.

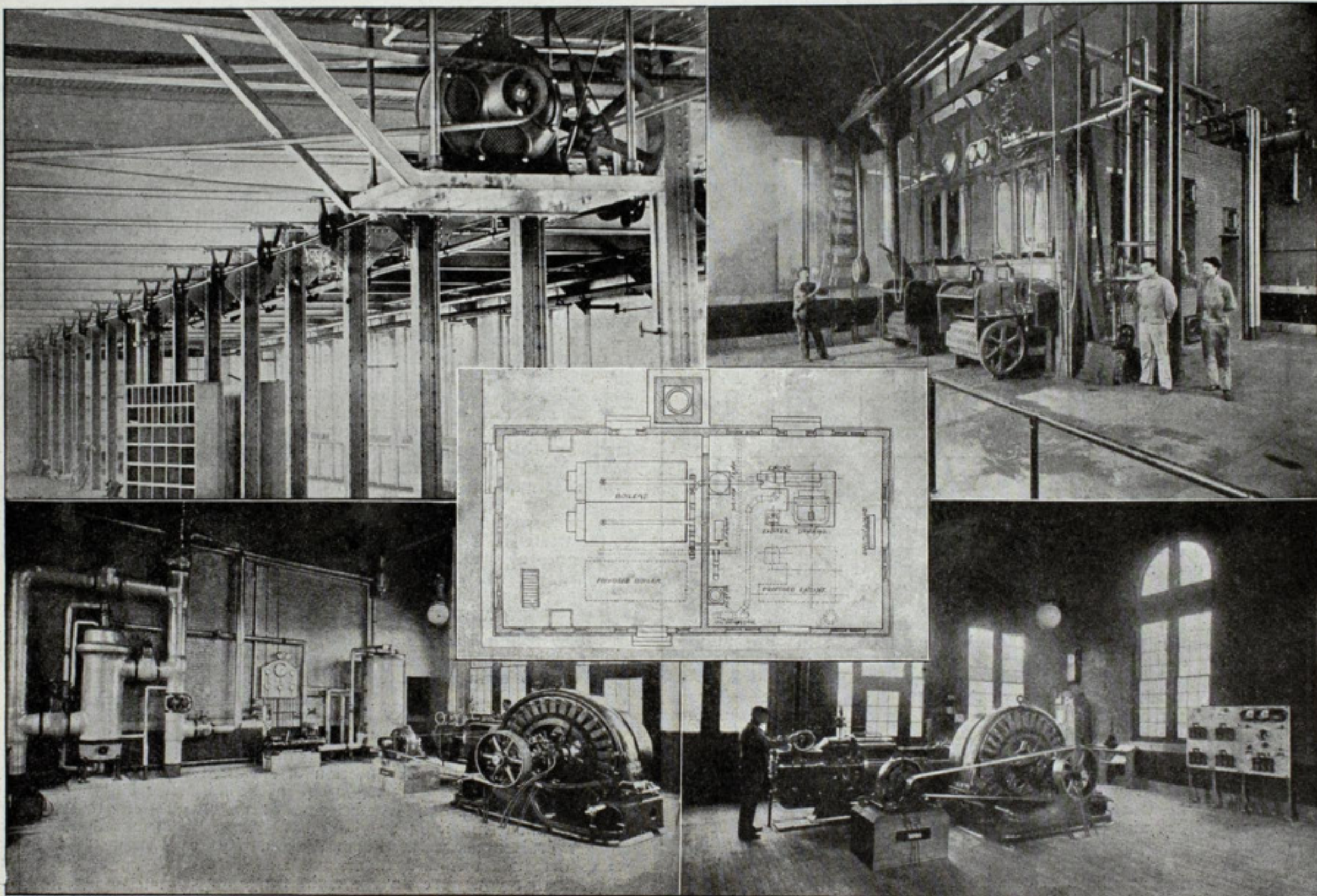
An electrical equipment containing the most up-to-date improvements has recently been installed by the Cleveland Twist Drill Co. at their factory in Cleveland. Sharing in the increased demand and prosperity of all steel and iron industries, this company has found it expedient to provide facilities for doubling their output. Mr. Geo. S. Rider, the well known consulting engineer of Cleveland, has been given a free hand in designing the extensions to the factory, and a new plant to supply light and power in substitution of the former steam drive. He selected the alternating current electrical system.

The factory of the Cleveland Twist Drill Co. occupies a rectangular lot near the lake front, measuring 340 by 280 feet. The machine shop, just completed, extends along the west side 340 feet with a width of 42 feet, so that the various departments now enclose the whole lot, leaving an open space in the center. The new structure is fireproof. At present

recorded. As the ashes are dumped from the stokers they are carried by the endless chain of buckets to the upper floor of the building and thence shot into a receptacle having a capacity of about 50 tons, and are discharged into cars alongside the building.

The electrical equipment has been supplied by the Westinghouse Electric & Manufacturing Co. The generating room contains one 150 K. W., Westinghouse, two-phase, 220 volt, 7,200 alternation engine type generator, which is direct connected to a 250 H. P. horizontal tandem compound steam engine running at 240 revolutions per minute. The fields are divided in a horizontal plane and are fitted upon the bed plate. The armature winding consists of rectangular copper bars, insulated throughout, and held in slots of the periphery of the armature coil by retaining wedges of fibre. The armature is constructed upon a cast iron spider pressed on the engine shaft with 75 tons pressure. The collectors are keyed separately to the shaft and are constructed upon an independent spider, which is also pressed upon the engine shaft. The field coils are wound for separate excitation from a 125-volt generator, and are supported upon the pole pieces so as to afford ample and thorough ventilation. The thirty pole pieces are constructed of laminated steel, cast solidly into the yoke, thus avoiding, as far as possible, eddy currents in

Cleveland Twist Drill Co.'s Electrical Equipment.



MOTOR ON CEILING PLATFORM OPERATING SHAFTING.

GROUND PLAN OF POWER HOUSE.

BOILER ROOM.

DYNAMO ROOM WITH PUMPS, SEPARATOR, ETC.

150 K. W. TWO-PHASE GENERATOR AND EXCITER.

three floors are completed, but provision has been made for increasing the building to five stories. The ground floor is used as a stock room for the raw materials, consisting mainly of high-class steel from which the drilling tools are made. The second floor throughout its entire length is devoted to milling and other manufacturing processes. It has been fitted up with lines of shafting, driven by electric motors, the milling machines being belted to the shafting. The third floor is utilized for grinding and polishing.

A new power house has been constructed at the center of the south front. The building is very substantially constructed on stone foundations, the stone walls being carried several feet above the ground, with brick superstructure. It measures 80 feet by 40 feet. Half of the space is devoted to the boilers and their accessories, and the other half to the generating machinery. The boiler room has been provided with the most modern improvements for labor saving and for mechanical operation. Two water tube boilers of 150 H. P. each provide steam at 140 pounds pressure. There is space for duplicating the capacity of the boiler plant. Mechanical stokers feed the furnaces. The coal supply has been given great attention. A branch of the Pennsylvania railroad runs close to the factory, and a private spur line has been led to the power house. Coal cars dump their contents, which fall into a coal crusher in the basement of the boiler room, and they are thence conveyed by an endless chain of buckets to the coal bunkers above the boiler room, these bunkers having a capacity of 350 tons. The coal falls by gravity into the hoppers attached to the mechanical stokers, and in passing down, the weight of the fuel is taken and the amount consumed by each boiler accurately

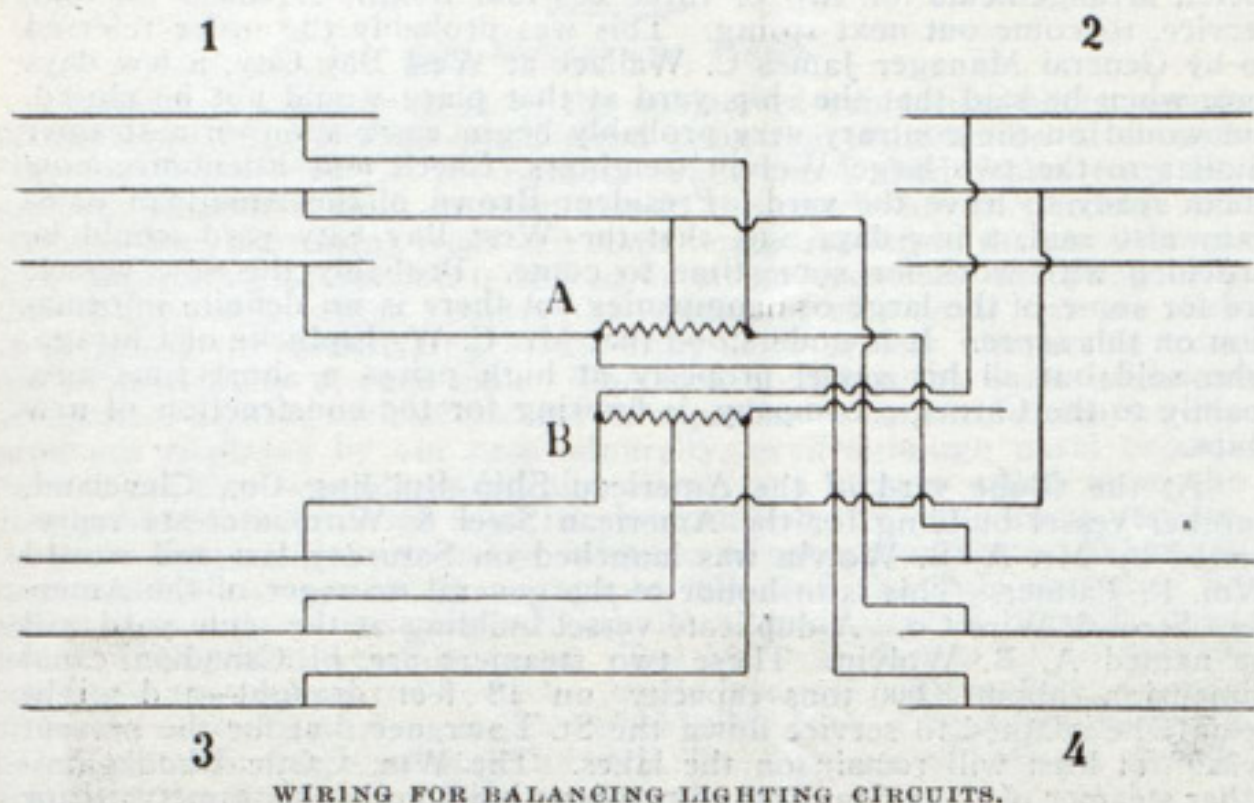
the pole pieces. A direct-current, compound-wound, Westinghouse multipolar generator is belted to the engine shaft, furnishing current to excite the larger generator. It is provided with an iron-clad, bar-wound armature, carbon brushes and ventilated field and armature windings, and has an approximate speed of 875 revolutions per minute.

The switchboard stands by the east wall of the building. Its construction follows the standard Westinghouse practice, consisting of three marble panels, one for the generator and two for the feeders. The usual instruments for controlling and operating the currents are mounted upon the panels.

The feeder circuits are carried from the switchboard into the basement of the power house, and thence are conducted by two underground conduits to the basements of the various departments of the works. The conduits have been very substantially constructed, one of them being 160 feet and the other 95 feet in length. They are 6 feet high with a width of 4 feet. The walls are of brick with stone slab top. These conduits serve not only for the electric feed wires, but also for the steam pipes for heating the buildings with the exhaust steam, and afford great facilities for repairs in case any of these pipes should leak.

Provision has been made for supplying electric current to 1,000 incandescent and 10 arc lights distributed throughout the buildings. The potential from the generator is 220 volts, which is conveyed to auto-transformers and reduced for the 110 volt lamps. The engineer has very ingeniously devised the lighting circuits so as at all times to bring an equal load upon each phase of the generator. The factory is divided for lighting purposes into three sections, it being built in "U" shape three

stories high, the power house completing the fourth side. On the middle floor of each section are placed two Westinghouse auto-transformers. In each section there are about 300 lamps, bringing about 150 lights on each auto-transformer, or seventy-five lights on each side of the trans-



former. Reference to the diagram shows the wiring to be so arranged that divisions 1 and 4 are fed from auto-transformer "A," and divisions 2 and 3 are fed from auto-transformer "B." The object of this device is to prevent unbalancing of the circuits, as should the lights on any entire side of the building be thrown off, the system would not be unbalanced.

An entire change has been made in operating the various floors of

factory vary from 13/1000 of an inch in diameter used by jewelers up to 4 inches in diameter. This company claims to make the only drill that has a flute of equal area from point to shank. They have other specialties which need not be mentioned, as their product is well known in the machine shops of all parts of the world.

Electricity is the great magician of the age. The latest advance in electrical science is the introduction of the alternating current system for operating factories. The result is shown in economy of operating expenses and in practically automatic working, since Westinghouse type "C" motors will run continuously if oiled once in three months, and a little attention is given to cleaning. They will carry a considerable overload, but if this becomes too excessive they stop, and as there are no commutators, brushes or other contact parts there is no fear of sparking nor burning out of the insulation. At starting these motors develop two to two and a half times their rate of full load torque.

Several large industrial factories in Cleveland and the neighborhood are now being fitted with alternating current apparatus, and in the present day when speaking of improved machinery, alternating current apparatus is intended to be conveyed.

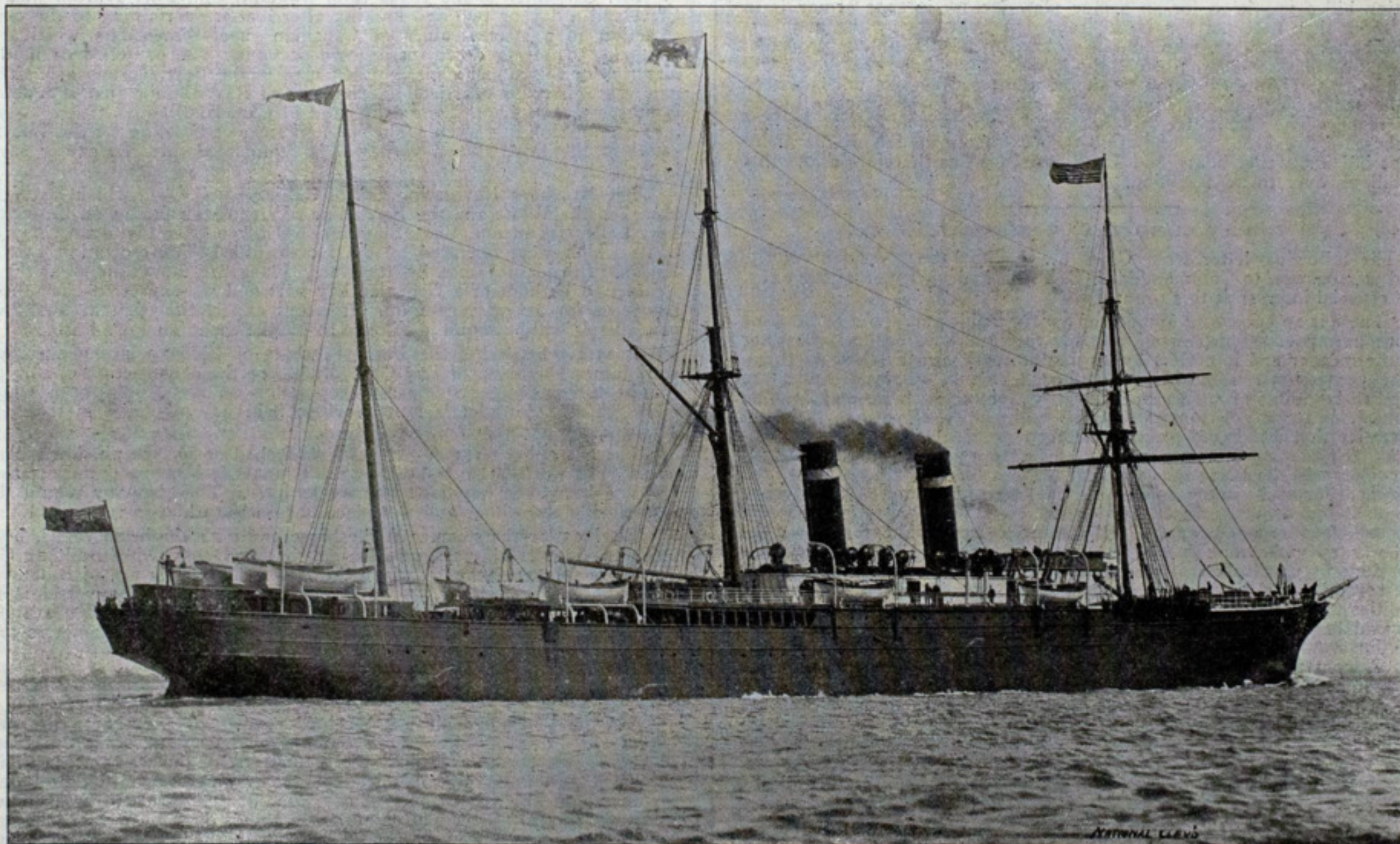
PROGRESS OF NAVAL CONSTRUCTION.

The monthly report of naval construction just issued by Rear Admiral Hichborn shows that of the Denver class of cruisers only the Chattanooga at the yard of Lewis Nixon, Elizabeth, N. J., has been laid down. The Chattanooga is represented as of 2 per cent completed. The progress of the other naval vessels is as follows:

Battleships—Kearsarge, Newport News, 99 per cent; Kentucky, Newport News, 99; Illinois, Newport News, 78; Alabama, Cramp & Sons, 95; Wisconsin, Union Iron Works, 91; Maine, Cramp & Sons, 25; Missouri, Newport News, 2; Ohio, Union Iron Works, 18.

Monitors—Arkansas, Newport News, 28 per cent; Connecticut, Bath Iron Works, 49; Florida, Lewis Nixon, 33; Wyoming, Union Iron Works, 45.

Torpedo boat destroyers—Bainbridge, Neafie & Levy, 56 per cent;



The Shenandoah.

the manufacturing departments, by abandoning the former steam drive and substituting lighter shafting directly driven by Westinghouse type "C" induction motors, a number of which have been installed. The motors are placed upon platforms suspended from the ceiling, occupying no valuable floor space. It is of more than usual interest to note the generally improved appearance of the factory where these motors are in operation. Apart from the fact that the introduction of electricity makes a great saving in the cost of fuel, the surroundings of the factory experience a marked improvement, a far more steady and efficient light being provided and induction motors are practically noiseless and are very cleanly. It has been found that operatives in these improved sanitary surroundings can do a better day's work.

A visit to the works of the Cleveland Twist Drill Co. is instructive in many ways. The rods of steel of various diameters pass through many processes to become the finished product. Material of the finest quality only can be utilized for twist drills. This high class steel is passed from hand to hand, for annealing, turning, milling, reaming, grinding, tempering and polishing. The machines for these processes are grouped in sections, usually one man operating eight machines. By this method of grouping any one section of shafting can be cut out when work is not in active operation, thus avoiding all loss of power. The drills made at this

Barry, Neafie & Levy, 56; Chauncey, Neafie & Levy, 56; Dale, Wm. R. Trigg Co., 72; Decatur, Wm. R. Trigg Co., 71; Hopkins, Harlan & Hollingsworth, 53; Hull, Harlan & Hollingsworth, 53; Lawrence, Fore River Engine Co., 90; Macdonough, Fore River Engine Co., 89; Paul Jones, Union Iron Works, 72; Perry, Union Iron Works, 72; Preble, Union Iron Works, 72; Stewart, Gas Engine & Power Co., 24; Truxtun, Maryland Steel Co., 19; Whipple, Maryland Steel Co., 19; Worden, Maryland Steel Co., 19.

Torpedo boats—Stringham, Harlan & Hollingsworth, 98 per cent; Goldsborough, Wolff & Zwickler, 99; Bailey, Gas Engine & Power Co., 87; Bagley, Bath Iron Works, 43; Barney, Bath Iron Works, 55; Biddle, Bath Iron Works, 6; Blakely, Geo. Lawley & Son, 83; DeLong, Geo. Lawley & Son, 83; Nicholson, Lewis Nixon, 53; O'Brien, Lewis Nixon, 53; Shubrick, Wm. R. Trigg Co., 85; Stockton, Wm. R. Trigg Co., 8; Thornton, Wm. R. Trigg Co., 81; Tingey, Columbian Iron Works, 58; Wilkes, Gas Engine & Power Co., 43.

Submarine torpedo boat—Plunger, Wm. R. Trigg Co., 85 per cent.

The North German Lloyd Steamship Co. will soon establish a line from Shanghai to Hankow, its steamers in the Asiatic service being thus increased to forty.

PRESENT PHASE OF NAVY BILL.

The naval appropriation bill, reported to the senate a few days ago by the naval affairs committee, carries a total of \$63,128,616, which is an increase of \$2,241,000 over the house bill and \$15,028,657 more than the naval bill of last year. The house provision for new naval vessels—two battleships, three armored cruisers and three protected cruisers—is retained, and an additional section inserted authorizing the purchase of five Holland submarine torpedo boats at a cost not exceeding \$175,000 each. The committee inserted a provision giving the secretary of the navy authority to equip one or more of the coast defense monitors now building with Gathmann guns for firing high explosives. Each vessel so equipped is to carry two guns of 16-inch bore, capable of throwing a shell containing 500 pounds of wet guncotton.

The house provision for armor plate was stricken out by the committee and in its place the purchase of armor for the Maine, Ohio and Missouri, now awaiting it, is authorized at \$545 per ton, which is the amount asked by the manufacturers for that made by the Krupp process. For the other vessels now building and provided for the price for armor is not to exceed \$445 per ton, with the proviso that if the armor is not obtainable at that figure the secretary of the navy shall cause the building of an armor plate factory to furnish the armor. Two million dollars is appropriated to begin the erection and equipment of the factory, which is to cost not exceeding \$4,000,000.

The limit of cost for rebuilding the Naval Academy at Annapolis is increased from \$6,000,000 to \$8,000,000. The house provisions giving cadets at the Naval Academy the title of midshipman, and reducing the course at the academy from six to four years were stricken out, but the appointment of cadets to the academy every four years is authorized. The latter provision, if it becomes law, will increase the attendance at the academy one-third. Another amendment appropriates \$300,000 for purchasing from the Spanish government the steel floating drydock in Havana harbor and transferring it to some port in the United States. The committee struck out the appropriation of \$100,000 each for barracks to take the place of regular ships at the New York and Mare Island navy yards.

The action of the senate committee in attaching to the naval appropriation bill a provision for an armor plate factory in case armor is to cost more than \$445 per ton is not regarded favorably by the members of the house committee, who fought so hard to keep a similar provision out of the bill when it was before the house. They hope the senate will not adopt the recommendation of the committee when the bill is passed by the senate, and, failing in this, they expect it to be stricken out in conference. The committee will accept the senate amendment for the purchase of five Holland submarine torpedo boats in lieu of the Cummings bill for twenty boats, and Mr. Cummings has therefore asked that his bill go over to next session.

FAVORING NAVAL SURVEYS.

The following letter from Capt. C. H. Stockton, president of the naval war college, to Commander C. C. Todd, hydrographer of the navy, is of especial interest at this time:

"There is an enormous amount of hydrographic surveying to be done in our new possessions, owing to their multitudinous insular character and the meager and imperfect hydrographic work already done in them. These possessions, from their strategic as well as intrinsic value, are bound to be points of attack in almost any war in which we may become involved, and our position now in the community of nations makes it imperative that we should prepare for their defense with the utmost dispatch. A necessary first step in such preparation is a thorough survey of their channels, harbors and adjacent waters. An adequate fleet and equipment for such survey and a personnel trained in hydrographic work cannot be found outside the navy, for our coast survey fleet is at present only sufficient for home waters, and all our hydrographic work since the civil war, even that done under the supervision of the coast survey, has been done by naval officers; moreover, since such surveys will necessarily take several years' time, there must, in the beginning, be a selection of localities to receive first attention, because of their strategic importance as naval bases, refuge harbors, torpedo boat harbors, etc., and such a selection would only be made under the supervision of the navy.

"A consideration of equal importance is that the defense of these possessions will fall to the navy, and the work of surveying them will familiarize naval officers with every detail of localities that we can with certainty predict will some day be scenes of naval conflict. The arguments to which I have confined myself seem sufficient to demand that the work be assigned to the navy as a measure of national defense, but we have in addition the obvious facts that the navy has the necessary fleet and trained personnel now on the scenes ready to do the work."

FAST TRIPLE-SCREW CRUISERS FOR RUSSIA.

The Russian cruiser Askold, recently launched at the Germania yard, Kiel, is one of four similar vessels now under construction. The vessel is intended to displace 6,000 tons on a 20-foot draught, the length over all being 426 feet, and the beam 49 feet. The protection consists of a steel deck varying from 1½ inches to 3 inches in thickness, the guns being provided with revolving shields, and the conning tower with 6 inches of plating. For armament she carries twelve 5.9-inch guns, two forward and two aft and the remainder on the broadside, a dozen 3-inch, eight 3-pound and two 1-pound quick-firers, with two machine guns and six torpedo tubes, of which latter only two are submerged. The Askold is a triple-screw ship and is fitted with three sets of triple-expansion engines, to which steam is supplied by nine Schultz boilers, the collective power being 19,000 i. h. p., from which a speed of 23 knots is expected. As will be seen, the vessel has no less than five funnels, and if the statement regarding her proposed complement be accurate she will carry the unusually large complement for a vessel of her class of 580 officers and men.

The Nickel Plate road offers special low rates to Milwaukee, Wis., account biennial meeting General Federation of Women's Club. Tickets sold June 1 to 4 inclusive; good returning until June 11, or by deposit until June 30 inclusive. Call on or address E. A. Akers, agent, Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind.

68, June 4.

REPORTS FROM LAKE SHIP YARDS.

It is understood that in addition to the large fleet of canal-size steamers for lake and coast service, for which the American Ship Building Co. expects to close a contract shortly, they have also about completed arrangements for two or three 500-foot freight steamers for lake service, to come out next spring. This was probably the order referred to by General Manager James C. Wallace at West Bay City, a few days ago, when he said that the ship yard at that place would not be closed, but would on the contrary very probably begin work soon on a steamer similar to the two large Wolvin freighters, Elwell and Edenborn, now about ready to leave the yard. President Brown of the American company also said, a few days ago, that the West Bay City yard would be provided with work for some time to come. Probably the new vessels are for some of the large ore companies but there is no definite information on this score. It is understood that Mr. C. W. Elphicke of Chicago, who sold out all his vessel property at high prices a short time ago, mainly to the Carnegie company, is figuring for the construction of new ships.

At the Globe yard of the American Ship Building Co., Cleveland, another vessel building for the American Steel & Wire interests represented by Mr. A. B. Wolvin was launched on Saturday last and named Wm. P. Palmer. This is in honor of the general manager of the American Steel & Wire Co. A duplicate vessel building at the same yard will be named A. B. Wolvin. These two steamers are of Canadian canal dimension—about 3,000 tons capacity on 18 feet draught—and might readily be adapted to service down the St. Lawrence, but for the present season at least will remain on the lakes. The Wm. Castle Rhodes, another steamer of Canadian canal dimensions building at this same yard for Robert R. Rhodes and others of Cleveland, is ready for service, and it is expected that the Rockefeller steamer Bunson, building at the American company's Chicago yard, will be launched on the 19th inst. Thus the list of some twenty-three steel vessels which the consolidated companies had under contract last fall is gradually being brought down to the six Carnegie freighters and two steamers for Eddy Bros. building at Detroit, which it was expected would be late in coming out.

Mr. Carpenter of the Jenks Ship Building Co., Port Huron, was in Cleveland a day or two ago looking after matters pertaining to the construction of a steel steamer of Canadian canal dimensions which his company is putting down on its own account. The greater part of the material for this vessel is already delivered in the Port Huron yard. The new vessel is to be practically a duplicate of Ravenscraig, just completed for the estate of Capt. Thomas Wilson of Cleveland, and which is to go into commission this week. The 500-foot steamer building for the Wilson estate at the Port Huron yard will be completed, Mr. Carpenter says, in August.

The Northern Navigation Co. of Collingwood, Ont., which last year absorbed the White and the Black line of steamers running on Georgian bay, Lake Huron and Lake Superior, has taken over the Beatty line of boats which were operated by the Northwestern Transportation Co. of Sarnia. President James Scott says: "Plans are being prepared for a steamer to be built at a Georgian bay port and we expect to have them before us for action very soon. It is our expectation that at least two new vessels will be required at once to handle the company's business."

It is reported that the Barry brothers of Chicago, are negotiating with James Davidson of Bay City, Mich., for the construction of a large freight and passenger steamer for operation on the Muskegon-Chicago route. If the contract is let, the vessel will be completed in time for service early next season.

The passenger steamer Mary was launched at St. Joseph, Mich., last week. She was bought last fall by the Graham & Morton Transportation Co. and burned at her dock two weeks later. The company rebuilt the boat during the winter and will place her on the Chicago run July 1.

Engines for the steamer Wilkesbarre and for a duplicate vessel, both large package freighters, are to be built by the Detroit Ship Building Co. These are the two steamers which the Union Dry Dock Co. of Buffalo is building for the Lehigh Valley Transportation Co. Each vessel is to have three Scotch boilers, built for 210 pounds pressure, and quadruple expansion engines of 20½, 30, 43 and 63 inches cylinder diameters and 42 inches stroke of piston.

DAMAGED MACHINERY IN NAVAL VESSELS.

The navy department has received reports of damage to the machinery of six naval ships—three attached to the Asiatic station and two on the Pacific coast—caused by the inefficiency of the warrant machinist in charge and want of proper supervision by officers who are now performing both line and engineer duty. One of the vessels to break down was only recently placed in commission and is now on a long voyage. When three days out there was a smashup in her engine room which crippled the machinery and will render an overhauling necessary when she reaches port.

Rear Admiral Melville, the chief of the steam engineering bureau, has remonstrated with the department against its policy of ordering to line duty so many officers who served as engineers prior to the passage of the personnel act, which transferred them to the line. This, he holds, leaves the duty of caring for the machinery entirely in the hands of the warrant machinists, who have neither the training nor the education for such responsible posts. Several protests have been made by Admiral Melville to the navigation bureau. In answer to these the bureau has shown that the demand is so heavy for line officers at sea that it is impossible to detail as many to engineer duties as the situation demands. On many ships where there were from three to five engineer officers before the passage of the personnel bill, there is now only one engineer in charge of the warrant machinists, who practically run the engines. On several of the smaller ships the warrant machinists stand all the watches and exercise practically complete supervision over the engine room and its force.

Collis P. Huntington has just sent out in pamphlet form his address upon the Nicaragua canal, which he delivered before the Galveston Chamber of Commerce. He is the foremost opponent of the canal and in the address he takes the position that it would be a disastrous venture both strategically and commercially. He calculates that it would lose about \$5,000,000 a year.

SUBMARINE BOATS.

AN ENGLISH VIEW OF THEM OF THE USUAL DISCOURAGING KIND—INCREASING INTEREST IN FRANCE AND GERMANY.

FROM ENGINEERING, LONDON.

Interest is again revived in the subject of submarine boats, owing to the report that France has decided upon the construction of a large fleet, 100 being given as the number, while the United States navy authorities have, it is said, come at last to the conclusion to purchase the Holland boat after many trials and some tergiversation in the naval mind. This uncertainty of opinion is shared by all governments, excepting only that of France, in which country the conditions of a naval war are such as to justify the undertaking of the risks more or less inseparable from the submersibility of such craft. The idea of submarine boats is almost antiquated, but the lack of success in experiments is justification for the prudence displayed by our own admiralty, even although naval experts have more than once sounded the alarm, and sternly called upon the government to rouse itself from its assumed lethargy. We know very little about the performance and possibilities of submarine boats. What has been available is essentially newspaper talk, and the little that may be accepted is not encouraging. No doubt a great deal of ingenuity and heroic daring have been displayed. But we want, first of all, to become convinced that submarine boats are useful weapons. Meanwhile, we may strive to devise a primary motor suitable for such a boat, which would be valuable for other purposes as well, for if we are to rely on electric accumulators, we may as well suspend the task.

Although it would not be quite accurate to say that there has not been advancement towards the solution of the inherent difficulties to submarine navigation, a glance at the successive experiments is not by any means encouraging. It is true that submarine boats have exercised the minds of laymen more perhaps than those of experienced constructors; the list of accidents might not have been quite so long if the lay element had kept aloof. But submarine boats remain dangerous craft; and if we have had no fatal accidents in recent years it is largely because we have learned to be careful, and have at least grasped the nature of the problems. The first submarine boat, indeed, did not drown anybody, but whether or not the great Cornelis van Drebbel actually submerged the boat which he exhibited before James I. on the Thames in 1624 is not quite clear. Day did go down at Yarmouth in 1660, and when he repeated his experiment boat and crew failed to reappear. Fulton was more successful; he kept four hours under water in 1801 and exploded a mine at Brest from his boat. Phillips' wooden boat was crushed by the water pressure on Lake Erie, and the same fate befell Bauer's iron boat in 1850 at Kiel; he and his two men had a marvellous escape, being carried up by the huge compressed air bubble. The boat of McClintock and Howgate, constructed in 1863 for the confederates in the American civil war, sank four times, and each time killed its volunteer crew, thirty-two men in all. All these craft had less than 30 tons displacement, employed water ballast and manual propelling power, and resembled plumply-built fish in their shape.

With the same year, 1863, began the days of the cigar-shaped boats of considerably larger tonnage, fitted with steam, pneumatic, petroleum or electric power, and sometimes with two separate sets of motors, for motion on the surface and under water. Noteworthy among these are Nordenfelt's four boats, which burned fuel when on the surface, and relied on the heat stored in the boiler when under water. During the last fifteen years another type has come to the front—boats which keep just under the water line and which are to dive under only in extreme cases. To this class belong the boats of Hovgaard, of Peral and the several craft which Admiral Aube had constructed; also the two boats of Goubet, Zédé's, Gymnote and the Gustave Zede. France has been most persevering in these endeavors. Last summer Romazotti's Morse was launched at Cherbourg; she is to have two sisters, the *Francais* and the *Algerien*; and there is finally Laubert's *Narval*, also launched at Cherbourg in October last, fitted with petroleum and electric motors and accumulators, whilst the other French boats mentioned depend entirely upon accumulators. Giorli's boat of 1893 is distinguished by three horizontal rudders, one of which is automatically adjusted by a pendulum. Finally there are the Holland boats, the last of which is entirely of Mr. Holland's own design.

The flooded boats, which keep awash, just under the water surface, look like torpedo boats. They are spacious enough not to need any compressed air stores for breathing, and the tube projecting above the water level, provided with a mirror at an angle of 45 degrees, is a help to the man at the helm—not much of a help, though, for the elevation is too small to give a proper field of view. In stability these craft are superior to the totally submerged boats, but they suffer from many of the drawbacks of submarine boats which are regarded as serious, notably by such an expert as Professor Busley. He is acting president of the newly-formed *Schiffbautechnische Gesellschaft*, a German naval constructors' institution whose inauguration recently was attended with so much eclat, due to the presence of the German emperor to hear the professor's contribution on this important subject of submarine boats.

Amongst those serious inherent difficulties, Professor Busley places first the low stability of submarine boats. Some people still seem to forget that the displacement center of gravity of a totally submerged boat is simply the mass center of the water displaced, and does not alter its position whatever inclination the boat may assume. There is no buoyancy. Yet transverse stability and prevention of rolling is not so difficult to obtain, provided the section of the boat is like that of an egg, poised on its point. If we use ballast, the center of gravity of the system will be low down, and the displacement center high up. The low longitudinal stability, the tendency to pitching, is the trouble. A man need only step forward to send the nose of the boat down. For this reason the *Plongeur* of Bourgeois failed, and the length of boats has been reduced again. Goubet has gone furthest in this direction and his two men always sit in the middle of the boat. Bauer tried to apply counterpoises, Holland automatic pumps, to restore longitudinal equilibrium. Nordenfelt did not deprive his boat of all buoyancy, and counteracted its effect by a submerging propeller. The flooded boats are better off in this respect. But even in their case we notice a reduction in length; the *Zede* had a length of 45 metres, the *Morse* of 36 metres, the *Narval* of 34 metres. It has,

on the other hand, been pointed out that they are not good sea-going boats, hardly fit for rough weather; and their own designers have proposed to give them a little freeboard. If we do that we lose the chief advantage of the submarine boat, the immunity against projectiles; and we may argue whether we had not better return to ordinary boats, in which we are not tied down to small space and small speed, and all sorts of undesirable conditions.

Submarine boats remain dangerous to manage. On the average perhaps we may construct them strong enough to descend to a depth of 100 feet. Supposing a boat, moving at the usual speed under water, 8 knots, is to discharge a torpedo. Two men are sent forward; the boat at once inclines 15 degrees, and within half a minute it will have arrived in its critical depth. If there is any delay or any fault in the steering gear or in the application of safety weights, etc., every second will seriously increase the pressure of the water outside. Trials made with the *Gymnote*, moreover, indicate that submarine boats do not obey their horizontal helms with sufficient rapidity. The *Gymnote* always overshot her mark, and would not keep on a straight course, but described a succession of curves. Professor Busley tried to pull a submarine boat under water; it could not be done when the speed exceeded 4 knots. That all operations near the coast or in shallow water are exceedingly dangerous need not be emphasized. Campbell's boat managed to wriggle herself out of the Thames mud again in 1886; the accident testified to the nerve and skill of Lord Charles Beresford, and also to his good luck.

These dangers are increased by the exceedingly limited range of sight under water. Light emanating from a focus under water will, at a distance of 100 yards, not have the ten-millionth part of its intensity, and not much of the daylight penetrates into the water as it is. On a clear day a diver 20 feet below the surface is hardly able to see further than 25 feet. Searchlights would be of little good, and would, moreover, betray the position of the craft. Hence the boat must approach the ship it wishes to attack very closely; and if the ship is moving the case is almost hopeless. So far we hardly know of submarine boats doing more than 8 knots. The slow speed is largely due to the weight of the batteries, which for a journey of five or six hours would weigh about 6 cwt. per indicated horse power; and we appear as far as ever removed from materially diminishing the weight of electric accumulators.

This low speed and the short period during which such a boat can be kept in motion without replenishing its charge limit the range of action of the submarine boats badly. The *Gymnote* could make a run of 45 miles at 10 knots, it has been said; most submarine boats have not accomplished so much as that. The submarine boat thus can merely be utilized for the defence of a port, and it is a very expensive means of defence. The *Narval* is stated to have cost about \$150,000. Adding a third to this sum we could construct a torpedo boat destroyer of four-fold speed and threefold displacement which may achieve something. Whether a submarine boat would ever escape from a successful attack is a very doubtful question. Professor Busley does not dwell upon that point. But if the boat almost has to feel its way up to the object of attack—because it cannot see to any distance—the chances of escape are decidedly poor.

NAVAL MATTERS.

The battleship *Indiana* is at the League Island navy yard undergoing a thorough overhauling.

The *Puritan* will be taken to the Norfolk navy yard, where about \$100,000 worth of repairs will be placed upon her.

The famous cruiser *Olympia* is in dry dock at the Charlestown navy yard. The entire work on the ship will require an expenditure of nearly \$500,000. The repair work will be most thorough and when it is finished the *Olympia* will be for her size the finest ship in the navy.

Capt. Brownson of the United States navy, who is supervising the work on the battleship *Alabama*, being built at Cramp's, has made a report to the secretary of the navy showing that the work is progressing so rapidly and satisfactorily that the vessel will be able to proceed to her trial trip by the last of June and that, except for painting and finishing up she will be prepared to go into commission as soon as her seaworthiness is proved.

The torpedo boats *Porter* and *Dupont* arrived at Newport, R. I., last week from New York and were docked at the flotilla wharves at the torpedo station. Although no time was taken the run from New York was quick. Half way up the Sound the *Dupont* asked permission to speed up to try her overhauled machinery and under three boilers she made close to 27 knots. As soon as all the torpedo flotilla arrives fleet practice will begin in Narraganset bay.

The cruiser *Albany* is still at the Elswick works in England, though it was expected that she would sail for this country in May. A report just received from Capt. J. E. Craig, who has been assigned to the command of the vessel, is to the effect that the cruiser is still tied up at the docks of the contractor. Capt. Craig says that there seems to be a serious hitch over the dynamos, and that although the contractors are working faithfully it is impossible for him to make a trustworthy prediction as to when the vessel will be ready to start for the United States.

CARNEGIE ON THE MERCHANT MARINE.

Andrew Carnegie gave out the following interview just before he sailed for Scotland a few days ago:

"I advocate earnestly the building of a merchant marine through favorable action by congress. It is better to build up a merchant marine than a great navy. Let the ships be so built that they may be utilized by the navy. It would be better for us to do without one or two battleships a year and add twenty or thirty ships to the merchant marine."

In regard to iron and steel industries, Mr. Carnegie said: "They are in good condition. Although prices may rule somewhat lower there will be no catastrophe. The iron and steel industries of the country are assured of prosperity for at least this year."

A wrought iron shaft which broke recently on the steamer *Puritan* of New York, New Haven & Hartford Railroad Co.'s service will be replaced by a hollow-forged steel shaft made by the Bethlehem Steel Co. at South Bethlehem, Pa. There is much satisfaction in the growing demand for high-grade steel shafts and general forgings for purposes for which wrought iron has been used hitherto.

MARINE REVIEW

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An inland nation, hampered in little by tariffs, may have a multitude of markets but nevertheless has its limitations. The pendulum of trade has the greatest swing in the nation of maritime instinct. The world belongs to the ocean carrier. The nation with a navy and a merchant marine is the nation which will enjoy the fruit of trade in the foreign markets of the world. Therefore the building of ships has a vital personal interest for every inhabitant of a country with a coast line. It is folly to say that the only persons who profit from ships are those who build them and those who own them. Their influence is direct not only to the mariner but to the manufacturer and agriculturalist. Ships open the way to the consumption of the products of the factory and the field. The revival of ship building is the clearest indication of prosperity, but more important than all, it is the one great means of maintaining that prosperity. All hail, therefore, to the renaissance of ship building. It is a healthful sign that the United Kingdom last year constructed ships of 1,416,791 tons; it would be gratifying as well as healthful if the United States was second in this procession. The shipping bill would give a wholesome stimulus to the construction of cargo carriers. Its passage would directly benefit the two great divisions of industry in the country—manufacture and agriculture.

The element of mystery has now crept into the armor controversy. Hints have been vaguely thrown out that a projectile has been invented that will pierce Krupp armor with the same ease that it pierces ordinary armor. The senate of the United States thought so much of the report that it went into secret session to discuss the armor plate clause of the appropriation bill—a thing unprecedented in the history of legislation. Senator Tillman, supported by several other senators, gave formal notice that he would move that the senate go into secret session to discuss the subject. It is understood that an official of the navy department has invented a projectile that will penetrate Krupp armor. It is to prevent the knowledge of this process from reaching the intelligence offices of other nations that the subject is discussed behind closed doors. In this connection it is interesting to note a Washington news dispatch which says that with one of the soft metal-capped shells of American manufacture, developed by the naval ordinance bureau, a 6-inch naval rifle plugged a clean hole through a plate of Harveyized armor 14 inches thick. The gun had a velocity of 2,580 foot-seconds.

In the race against time across the ocean the British liners have succumbed to the nerve-destroying competition of the German lines. The Hamburg-American line has not rested since the Kaiser Wilhelm der Grosse of the North German Lloyd fleet smashed the ocean record. The Deutschland was built to wrest the prize from the North German Lloyd line. She is under contract to maintain a speed of 23 knots an hour and will give a demonstration of her ability in less than a month now. The North German Lloyd company is not waiting, however, for the result of the initial trip of the Deutschland. It takes it for granted that the contract will be fulfilled, for it has already started upon the construction of a steamer which is designed to have a displacement greater even than the Oceanic and an engine power unapproached by any ship afloat. This new leviathan of the deep is already classed as the four-day boat. It is to be built by the Vulcan company at Stettin.

The navy has been agitated from center to circumference during the past two weeks over the attempt to transfer the ocean surveys from the naval hydrographic office to the Coast and Geodetic Survey. The house, under the leadership of Representative Cannon, reduced the appropriation for ocean surveys in the naval appropriation bill from \$100,000 to \$10,000, which translated meant that the navy was not to make the surveys at all. The house program left the lakes completely in the lurch, because the coast survey does not include the lakes. The senate naval committee has restored the appropriation to \$100,000 and the conference committees will now settle the controversy. The hydrographic office has a superb equipment; it understands thoroughly what the mariner needs; its charts are the standard charts of the world; its aids to navigation are the most precious bits of literature to the navigator; and viewed from whatever point one may, it would seem to be the course of wisdom to leave this work with the naval hydrographic office.

The William R. Trigg Co., ship builders, Richmond, Va., writing to the Review say that they contemplate improvements in the way of new buildings, tools and real estate covering an expenditure of about \$600,000.

FORTY PAGES REGULARLY IN THE MARINE REVIEW.

With this issue another addition of four pages is made to the Marine Review and the regular issue in future will be forty pages every week. Our readers will therefore agree with us that we are justified in issuing the following circular to subscribers:

"The Marine Review begs to inform you that beginning with June 1, 1900, the subscription price will be \$3 per annum in the United States and Canada and \$4.50 in foreign countries. It is a well recognized principle in newspaper making that the price of the publication must cover the cost of paper and press work, which enter into its composition—otherwise the more subscribers a paper would have the more it would lose. The Marine Review has grown to such proportions (double what it was eighteen months ago) that the cost of paper and press work in the individual copy is more than the price of it to the subscriber. This, in itself, is a most healthful sign, for it bespeaks a constant growth in the volume and variety of reading matter and illustrations. The Review has hesitated in taking this step, but the wholesome and healthful increase in the cost of production has compelled it to do so. It is founded upon the soundest of business reasons, and, we hope, will commend itself to your judgment."

LAKE SUPERIOR FREIGHT MOVEMENT.

On May 1 a year ago only a few small vessels had passed through the St. Mary's Falls canals. They carried no freight. This year there was moved through the canals to May 1 a total of 473,482 tons of freight. The opening was earlier than in 1899 but not as early as in 1898 when 710,366 tons of freight was moved through the canals in April. Following is the record of both canals (Canadian and United States) to May 1 of each year for three years past:

	VESSEL PASSAGES.	REGISTERED TONS.	FREIGHT TONS.
To May 1, 1900.....	427	539,191	473,482
To May 1, 1899.....	42	10,230	..
To May 1, 1898.....	856	735,713	710,366

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To May 1, 1900.	To May 1, 1899.	To May 1, 1898.
Coal, anthracite, net tons.....	43,242	.....	3,600
Coal, bituminous, net tons.....	111,499	.....	195,972
Iron ore, net tons.....	204,563	.....	282,314
Wheat, bushels.....	2,541,627	.....	1,910,500
Flour, barrels.....	97,050	.....	232,250

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO MAY 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.				
ITEMS.	Designation.	To May 1, 1900.	To May 1, 1899.	To May 1, 1898.
Copper	Net tons....	674	.....	7,097
Grain, other than wheat	Bushels....	529,000	.....	3,019,455
Building stone	Net tons....	.....	.....	.....
Flour	Barrels.....	97,000	.....	232,250
Iron ore	Net tons....	204,563	.....	282,314
Iron, pig	Net tons....	.....	.....	.....
Lumber	M. ft. b. m.	.....	.....	11,919
Silver ore.....	Net tons....	.....	.....	.....
Wheat	Bushels....	2,541,627	.....	1,910,500
Unclassified freight	Net tons....	1,393	.....	10,780
Passengers.....	Number....	129	.....	100

WEST BOUND.				
Coal, anthracite.....	Net tons....	43,242	.....	3,600
Coal, bituminous.....	Net tons ..	111,499	.....	195,972
Flour	Barrels	50	.....	.....
Grain	Bushels .....	.....	.....	250
Manufactured iron.....	Net tons....	1,410	.....	11,403
Salt	Barrels	25,277	.....	12,156
Unclassified freight.....	Net tons....	7,859	.....	19,723
Passengers.....	Number ...	117	.....	272

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To May 1, 1900.	To May 1, 1899.	To May 1, 1898.
West bound freight of all kinds, net tons.....	167,804	.....	233,800
East bound freight of all kinds, net tons.....	305,678	.....	476,566
	473,482	.....	710,366

The mean level of Lake Superior in April was four-tenths of a foot higher than in April a year ago and about half a foot higher than the average April stage for the twenty-six years from 1872 to 1897.

WORK OF OCEAN SURVEYS.

THE NAVY RESISTS THE ATTEMPT TO TRANSFER THE WORK TO THE COAST AND GEODETIC SURVEY—A SUMMARY OF OPERATIONS OF THE HYDROGRAPHIC OFFICE OF THE NAVY.

The dominant topic of discussion in the navy department today is the transfer of the hydrographic work from the navy department to the coast survey. The house in passing the naval bill reduced the appropriation for ocean and lake surveys from \$100,000 to \$10,000. The senate naval committee has recommended the restoration of the appropriation to the original sum—and that is how the matter now stands. The issue will have to be fought out in conference.

Representative Cannon of Illinois earned the unbridled wrath of the navy when he said that ocean surveys could better be made by civilians. The navy department replied hotly that it has always made the surveys of the oceans; that the navies of all nations make ocean surveys; and that even the harbor surveys of the coast and geodetic service had been made under the supervision of the navy. The thing of especial moment in the controversy to lake interests is the fact that the coast survey does not cover lake work and that the reduction of the appropriation means that all hydrographic work along the lakes ceases.

The history of hydrography is interesting. In all nations except the United States it is under the complete supervision of the navy department. The hydrographic office of Great Britain is attached to the admiralty, being under the direction of its first lord and presided over by the hydrographer of the navy. The jurisdiction of this service covers home, colonial and foreign coasts. The foreign surveys are carried out exclusively by vessels especially assigned and receiving instructions from the hydrographer. The ruling idea is to publish accurate charts best suited for the uses of the navigator. The functions of the hydrographic department are various as well as numerous. The most important are to execute accurate surveys of all parts of the world which are visited by British ships, whether of war or commerce, and to prepare and publish these surveys in the form of charts. The hydrographic offices of the continental nations are founded upon the same lines.

From a list published in the report of the superintendent of the United States coast and geodetic survey of the names of the hydrographers in charge of the survey work for 2,222 hydrographic sheets and other sheets, issued from January, 1834, to December 31, 1895, 1,711 parties were in charge of naval officers and 823 of civilian officers. Of the 823 civilian parties 670 worked exclusively in rivers, bays, lakes, harbors and generally in inland waters, leaving 153 outside surveys in all, as against 1,711 in charge of naval officers.

The hydrographic office entered into the publication of navigational charts of the great lakes by reason of the fact that the lake survey of the United States army engineer corps was completed prior to any proper survey of the Canadian shores. Their resulting charts were, therefore, good for navigational purposes on the American coasts only. As far as the marine department of the Canadian government completed its surveys of the Canadian coasts of the great lakes the results were utilized by the hydrographic office.

The secretary of the navy in his report for 1882 says: "For the past fifty years the coast survey has required and received the support and assistance of the navy. Thirty naval officers a year on an average have been engaged in the work, and during the last ten years the number has steadily increased. Of the officers now on the active list of the navy 232 have at various times been so employed. The amount expended from the naval appropriation for the pay and maintenance of the officers and men employed on coast survey duty in the year 1881 was \$220,931.64. As the direct appropriation for the coast survey for the same year was \$567,507.06 it appears that nearly one-third of the total expense of the survey was borne by the navy. The preparation of charts and sailing directions is a work which falls properly within the scope of a naval establishment. It has no inherent connection with the affairs of any other department of the government. As now organized it is carried on by a nearly independent bureau of the treasury department, but the work is largely done by naval officers and largely supported by naval appropriations. In view of these considerations the union of the coast survey administration with that of the navy is suitable and proper and would be advantageous to both."

Since that time some 600 odd naval officers have been assigned to duty with the coast survey, making a grand total since 1832 of about 2,200 naval officers.

Again in 1883 the secretary of the navy has this to say: "The coast survey originally established for the purpose of making hydrographic charts has of late years extended its functions in a totally different direction, that of geodetic surveys in the interior. In making this extension it has gradually abandoned the water survey to the navy, until now the actual work in this field is done almost exclusively by naval officers withdrawn for the purpose from the direction and control of their own department. By an extraordinary anomaly in legislation the United States hydrographic office, an indispensable branch of this department, is allowed to survey and make charts of every coast in the world but that of the United States; while the best naval surveyors are claimed by another department to perform this work under its supervision. Sixty-seven naval officers are now diverted in this manner from the direction of the navy, and 280 seamen out of the 7,500 allowed to the navy, are now on board coast survey vessels. For such an arrangement there might be some show of a reason if the work upon which the officers are engaged were especially connected with the department under which they are placed, and remote from the subjects of which their own department has cognizance; but in view of the fact that no part of this work has the faintest traceable connection with the general purposes of the treasury, that its effectual performance is of vital importance to the navy, and that an office exists today in the navy department where similar work is necessarily carried on it is inconceivable why so inconvenient, artificial and indefensible an arrangement should be perpetuated. The existing office might properly continue the geodetic work which seems gradually to be absorbing its attention and its appropriations, while the hydrographic surveys on our own coast, now performed by naval officers under a naval inspector, in the office of the geodetic survey, should be carried on, like other hydrographic surveys, by the naval hydrographic office."

The hydrographic office of the navy department has connections with

the nautical world unattainable by the coast survey establishment. It publishes a monthly pilot chart of the North Atlantic ocean, which is a chart compiled from the co-operative work of nearly 3,000 volunteer observers of the weather and other conditions at sea, chiefly captains of vessels, including all maritime nationalities. The hydrographic office, besides its agencies for the sale of charts, has eleven branch offices in various maritime cities of the United States, which are in charge of officers of the navy and nautical experts, where advice and information are given gratis to the nautical community, and where all kinds of reports of the weather and nautical occurrences are rendered by the maritime community without charge. The hydrographic office also takes cognizance of the existence of wrecks and derelicts over the oceans, and publishes reports of them for the benefit of shipping. It receives daily reports of these menaces to commerce and forwards them to the secretary of the navy, who directs the destruction of many of them by employing naval vessels for the purpose. Besides over 900 hydrographic publications of its own that it sells to the public and issues to naval vessels, it keeps correct and issues to the United States men-of-war the publications of the coast survey and about 2,000 separate publications of the British admiralty. It therefore issues upwards of 3,000 hydrographic publications. It also maintains a system of exchange with the hydrographic offices of every other maritime nation.

The navy department is now carrying on surveys with the steamers Yankton and Eagle in the harbors of Nuevitas, Gibara and Nipe, on the north coast of eastern Cuba, in the islands of Culebra and Bieque, lying eastward and forming a part of Porto Rico, with the steamer Vixen, and in the island of Guam with the steamer Yosemite; and has issued the necessary instructions for the survey of the Midway islands together with Seward roads and Welles harbor in the Hawaiian islands by the steamer Iroquois, and for the commencement of the survey of the Philippines by the steamer Bennington and five others of the smaller steamers now attached to the naval forces in the Philippines.

In addition to the surveys mentioned, the navy has, within the last quarter of a century, surveyed the Nicaragua, Panama and Tehuantepec routes for the canal across the Central American isthmus, the harbors of Greytown and Brito at the Atlantic and Pacific termini of the Nicaragua canal route, the harbors of Colon and Panama at the Atlantic and Pacific termini of the Panama canal route, the route for an ocean telegraph cable from California to the Hawaiian islands, the west coast of Mexico and Central America from San Diego to Panama, including all the harbors of that coast and embracing an extent of coast line equal to that of the Atlantic and Gulf coasts of the United States, the southern entrance to the Detroit river and the harbors of Chicago, Cleveland and Erie on the great lakes, and also the survey of many important obstructions to navigation in those waters, the harbor of Bluefields in Nicaragua, the bay of Honduras and Guatemala, the San Juan river and the approaches to Guamoco in Venezuela, and a large amount of geographical and cartographical information relating to all parts of the world has been contributed by the officers of the vessels of the general naval service under the provision of the regulations for the government of the navy, which requires reports and surveys concerning the imperfectly-known localities that are visited.

Indeed, every argument which has so far been advanced is in favor of the continuance of this work by the naval hydrographic office and the consequent restoration of the appropriation to its original proportion.

PROPOSED CHANGE IN "DUMMY" LIGHT.

Col. Wm. P. Anderson, chief engineer of the department of marine and fisheries, Canada, recently visited the burned "Dummy" light on the end of Point Pelee, Lake Erie, and reports that the pier would have practically to be rebuilt before a new light and fog alarm could be installed upon it. He suggests that instead of incurring a large expenditure on this pier it would be more in the interests of navigation to spend the money in establishing a first-class light and fog alarm station on the middle ground, leaving the question of re-establishing the "Dummy" light for future consideration. He states that with a light on the middle ground, vessels could make a straight course for it from either direction clear of Grubb reef to the westward and clear of South-east reef at the eastward and that this would be a great advantage, especially to deep-draught freighters.

The deputy minister of marine and fisheries has presented Col. Anderson's views to officials of the Lake Carriers' Association, and as soon as masters of lake vessels can be heard from on the subject, the Canadian government will be advised of their opinions. It is more than probable that the change recommended by Col. Anderson will be approved.

SEAMLESS STEEL TUBE CO.

Senator James McMillan has formally organized the Seamless Steel Tube Co. of Detroit, Mich., capital \$100,000, which will occupy the old plant of the Malleable Iron Works, to manufacture steel tubing for boilers, bicycles, etc. The works will employ about 700 men, and the value of the first year's output will exceed \$1,000,000. The principal stockholders are: Senator McMillan, W. C. McMillan, Thomas H. Simpson and William Thornbrough of Cleveland. The works will be opened for business about May 15.

The Greek corvette Admiral Miaoulis is to visit this country sometime during the summer on the annual cruise of its cadets. She will bring a complement of 192 seamen and petty officers in addition to forty commissioned officers, of which thirty will be ensigns going out for instruction.

Anywhere and return for one dollar on the Nickel Plate road—Anywhere and return for one dollar means that parties of five or more traveling together on one party ticket and returning same day may travel on Sundays on any one of the peerless trio of daily express trains between any two given points within the distance of one hundred miles. Not necessary to organize parties large enough to justify special train service to secure the low excursion rate. Organize parties of any size of five persons or more and enjoy a Sunday outing on the Nickel Plate road. Any agent will explain it. Write, wire or phone E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind.

71, June 5.

NEWS FROM BOTH COASTS.

NO ABATEMENT IS NOTED IN THE GENERAL ACTIVITY OF THE SHIP YARDS—
CONTRACTS FOR NEW VESSELS, TRIAL TRIPS, ETC.

A ferry boat, the General Sumner, was launched from the ship yard of William McKie on Border street, East Boston, last Saturday. The boat was christened by Miss Jennie E. Graves. Mayor Hart and many city officials were present. The vessel's principal dimensions are: Length over all, 164 feet 3 inches; beam, extreme, over guards, 57 feet; beam over plank, 37 feet; depth of hold, 14 feet 1 inch. The main engines are of the vertical, inverted, double compound type, with two high pressure cylinders of 14 inches diameter and two low pressure cylinders of 28 inches diameter. Steam will be supplied by two boilers of the gunboat type, designed for a working pressure of 125 pounds per square inch.

Percy & Small of Bath, Me., have leased the Reed ship yard at Bath from Augustus Palmer and will build thereon at once a five-masted schooner for J. S. Winslow & Co. of Portland, Me. The schooner will be similar in size and design to the five-masters Myron D. Creecy and Helen W. Martin, also built by Percy & Small. With this addition Percy & Small have three yards in operation. At their own yards they are putting up a mammoth six-masted schooner of 5,000 tons carrying capacity, the largest vessel of her type ever constructed, and at the McDonald yard they are building a five-master for Capt. Mitchell Reed of Boothbay, now in command of the George E. Walcott.

The new Cromwell line steamer Comus has just been turned out from the yards of the Newport News Ship Building & Dry Dock Co. at Newport News, Va. She has just started on her initial trip from New York to New Orleans. This vessel is constructed of steel throughout and is 406 feet long, 48 feet beam, 33 feet 9 inches depth of hold and has a gross measurement of about 5,000 tons. The Comus is furnished with triple expansion engines that have cylinders of 32, 52 and 84 inches diameter, with a stroke of 54 inches. Steam is supplied from three double-ended cylindrical boilers. The steamer was designed by Horace See of New York.

At Hoboken, N. J., the Tietjen & Lang Dry Dock Co. has under construction a large sectional dry dock. It is being built in 80-foot sections with a clear opening between the wings of 90 feet. Three sections have been completed and are in place at the yard and two other sections are well under way. The length of the dock will be 468 feet, and it will be equal to the accommodation of a 500-foot vessel. Another dock of four sections is to be built adjoining the five-section dock, and when it is desired to dock vessels of 700 feet or over the whole nine sections will be coupled up, making a total over all length of about 800 feet.

In about two weeks Arthur D. Story will launch from his ship yard at Essex, Mass., the new steamer Cape Cod for the Boston & Provincetown Steamboat Co. This steamer will run between Boston and Provincetown and will have capacity for 1,600 passengers. She is 165 feet over all, 153 feet water line and 30 feet wide, with a draught of 10 feet. She is fitted with a triple expansion engine and four boilers and is designed for a speed of 15 miles.

Bids will be opened by the bureau of supplies and accounts, navy department, Washington, D. C., on May 15 for supplying the Portsmouth navy yard with the following articles: One double iron frame lever set, left hand circular saw mill, No. 2½, with carriage 46 feet long; one boiler plant complete; four dust collecting systems complete; two pairs of platform scales, extra heavy; two arbor presses, one No. 3 and one No. 3½; also pipe stocks, dies, clamps and drills.

Bids will be opened by the bureau of supplies and accounts, navy department, May 15, for supplying the Norfolk navy yard with the following articles: One horizontal bending machine for bending steel plates up to 1 inch in thickness and 24 feet in length; one direct-connected electric generating set, consisting of two generators and a direct-connected engine, the engine to be a cross compound condensing engine of the automatic type.

An entire new ship building plant will be erected at Weymouth, Mass., by the Fore River Engine Co. The company has just purchased a 350 horse power tandem compound condensing Hamilton Corliss engine from Hooven, Owens & Reutcher, 39 Courtland street, New York. The Fore River company has a number of torpedo boats and torpedo boat destroyers on hand for the United States government.

The William R. Trigg Co., Richmond, Va., launched the torpedo boat Thornton last week. The vessel was christened by Miss Mary Thornton Davis of Worcester, Mass., a grand niece of the late Capt. Thornton. The new boat is 175 feet long and 17 feet beam and will draw 4 feet 8 inches on a displacement of 165 tons. The contract price was \$129,750.

Tug No. 20 of the New York Central Railway is in the hands of Brown & Miller of Jersey City receiving a steeple compound engine in place of the old one which they are taking out. The Burlee Dry Dock Co. is giving the tug Dorothy, also of the New York Central fleet, a thorough overhauling, and when she comes out she will be known as N. Y. C. No. 3.

One of the eighty-five Shaw & Spiegel steam towing machines in use and manufactured by the American Ship Windlass Co. is on the steamer Kvichak, recently launched by the Wolff & Zwicker Iron Works, Portland, Ore. This steamer has also received a steam windlass and a steam cargo hoisting winch of the American Ship Windlass Co.'s manufacture.

A new tugboat, the Michael Moran, mate to the DeWitt C. Ivins, is of 121 gross and 82 net tons. She has just been finished at the works of the Neafie & Levy company, Philadelphia, and will engage in towing in the harbor of New York. She is of modern steel construction with steel deck houses, and is one of the best of her class.

Capt. John McIntosh, who has been in command of the Ward line steamship Mexico, will shortly go to the Cramp ship yards at Philadelphia to superintend the finishing touches upon and launching of the Ward line steamship Morro Castle, which will leave the ways about July 1. The vessel will ply between New York and Havana.

Nineteen carloads of Krupp armor plate have been shipped from the Bethlehem Steel Works to the Cramp ship yards at Philadelphia. The consignment consisted of 500 tons for the Russian battleship Ret-

vizan and 150 tons for the United States battleship Alabama. The value of the shipment is \$400,000.

At the yard of James & Tarr, Gloucester, Mass., two schooners are in process of construction. One is for Fred L. Davis of Gloucester and is 90 feet long, 24 feet wide and 10 feet deep. The other is for Capt. Sylvester Whalen of Boston and is 118 feet long, 25 feet wide and 11 feet 3 inches deep.

William R. Osborn of Croton, N. Y., has delivered to the Palmer Morot Works at Mianus, Conn., one 20-foot, one 25-foot and four 17-foot launch hulls. Mr. Osborn has taken an order to build a new 40-foot high-pressure tug for the Powhatan Phosphate Co. of Norfolk, Va.

The big ocean-going tug Gypsum King, built by the Burlee Dry Dock Co., Port Richmond, S. I., recently left Boston for Nova Scotia with the longest tow and the greatest tonnage that ever left the Hub. The length of the tow covers 1¼ miles.

William Case of Newburgh, N. Y., has given the propeller D. S. Miller a thorough rebuilding and the vessel will hereafter be known as Poughkeepsie. She is for service between New York and Hudson river points.

A new ferryboat with all the latest improvements and to cost \$200,000 will be built by the Burlee Dry Dock Co. of Port Richmond, S. I., for the Pennsylvania railroad, to take the place of the Chicago, which was sunk.

A new dry dock at the establishment of the Newport News Ship Building & Dry Dock Co., Newport News, Va., will be ready for use by November. It will be the largest dry dock in the United States.

The Roberts Water Tube Boiler Co., Red Bank, N. J., has nearly \$100,000 worth of orders on its books. The company has just sent 2,000 horse power of boilers to the Craig Ship Building Co., Toledo.

The Savannah Foundry & Machine Co. of Savannah, Ga., has been given an order to repair the pilot boat J. H. Estill, which was recently damaged by the British steamer Thornaby.

The senate committee on naval affairs has recommended that the naval appropriation bill be so amended as to authorize the purchase of five Holland submarine boats.

John E. Thropp & Sons Co., Trenton, N. J., have taken some excellent photos of their marine engines, which they will supply to the trade upon request.

Work is progressing favorably on the Isham ship building plant at Mystic, Conn. An engine and derricks have been delivered.

The Mexican steam tug Canuto Bulnes is undergoing a thorough repairing at the Johnson Iron Works, New Orleans, La.

Ways for the new United States cruiser Denver are now being built at the works of the Neafie & Levy Co., Philadelphia.

The Harlan & Hollingsworth Co., Wilmington, Del., is overhauling the steamer Brandywine.

ALONG THE PACIFIC COAST.

John B. Hardy of Tacoma, Wash., ship builder and maker of logging and mining machinery, engines, boilers and electric plants, writes that he has in process of construction the machinery and boilers for the new steamer Mainlander, which is to be put on the run between Tacoma and Vancouver, B. C., by Cook & Co. of Tacoma. This vessel will be 160 feet long, 29 feet wide and 12 feet molded depth. The engine is to be triple expansion, 16, 27 and 44 inches by 24 inches stroke, with steam reverse gear and all modern improvements. The propeller is to be a Case outward thrust of 8 feet diameter and about 12 feet pitch. The vessel will have two Seabury water tube boilers, each with 52 feet of grate and 2,000 feet of heating surface. This vessel is expected to be the most complete in equipment that has ever been built in Washington.

The Oregonian of Portland, Ore., says: "There are at the present time building or under contract to be built in Pacific coast yards nearly twenty large sailing schooners. They are to be of best Oregon fir and are intended primarily for the lumber trade. They will carry from 750,000 to 1,200,000 feet of lumber, and most of them will sail anywhere without the need of ballasting, thus materially reducing the cost of operation."

Messrs. Hay & Wright, Alameda, Cal., recently laid the keel for a large schooner for general freighting trade. She will be 190 feet on the keel. The four-masted schooner under construction by the same firm is nearly completed. She is intended for the San Francisco and Mexican trade and will be named William Olsen.

It is said that the Wolff & Zwicker Iron Works of Portland, Ore., will erect a ship building plant and machine shop to cost \$250,000 at St. Johns.

CONSULAR REPORTS ON MARINE SUBJECTS.

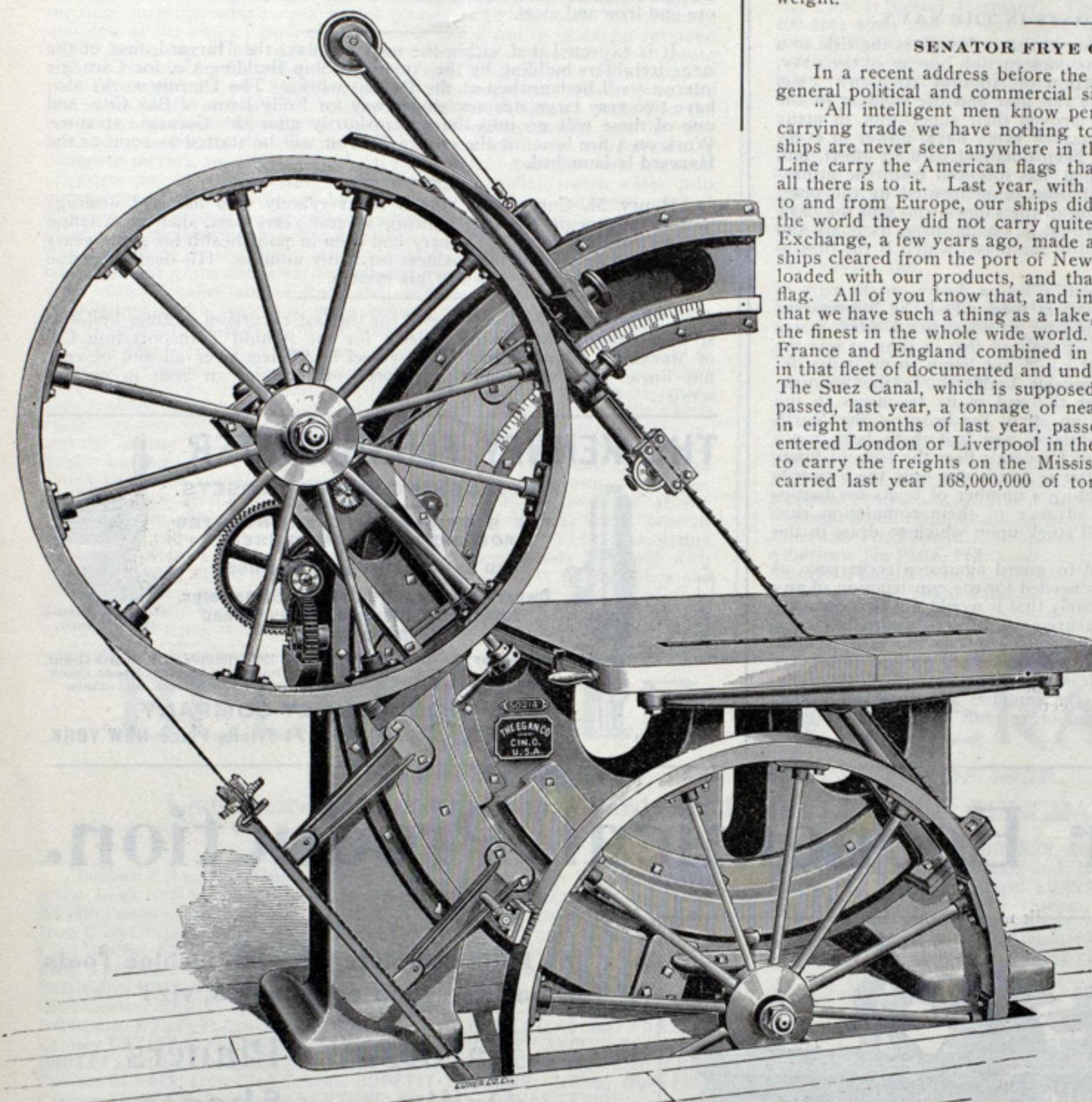
Richard Le Bert, consul to Ghent, reports that the first vessel to pass through the new canal at Bruges was an American bottom with a cargo of lumber from Florida. The canal runs from Zeebrugge, a port on the North sea, 14.29 miles north of Ostend, to the city of Bruges, a total distance of 7.46 miles. The work is now so far completed that vessels of a draught of 25 feet can enter and pass to the port of Bruges. The locks are fully completed, as well as three-fifths of the wharf wall at Bruges. When finished the wharf wall will have a total length of 1,575 feet. The canal has a width of 72 feet 6 inches at the bottom and 229 feet 4 inches at the water level, and will have, when completed, a depth of 26 feet 3 inches; this will also be the depth of the interior port and of the great basin of Bruges.

Daniel E. McGinley, consul to Athens, reports that the Greek merchant marine is steadily declining. The Greek merchant marine was in a flourishing condition until 1870, since which date it has steadily grown less in number of craft, though not so much in tonnage or value, as steam vessels of a larger average tonnage are supplanting the smaller sailing craft. The tonnage of sailing craft has decreased as the tonnage of the steam craft has increased. In 1881 the tonnage of steam vessels amounted to but 21,000 tons; today it amounts to over 96,000 tons, but the sailing craft has almost entirely disappeared except in the coasting trade.

BAND SHIP SAW.

We illustrate a new machine just brought out and placed on the market by the Egan Co. of 325-345 West Front street, Cincinnati. It is what is known as the company's No. 8 band ship saw.

This ship saw is constructed on an entirely new principle, and was specially designed for sawing different angles on ship timbers. The departure from the old method of doing this kind of work on a tilting table is a radical one, which favorably presents itself immediately to the practical eye of the ship builder. The points enabling this machine to thoroughly and accurately perform its work with rapidity are that both wheels are made to move on a radius, the centre of which is the point at which the blade passes through the top of the table, and a clearly stamped



index within sight of the operator enables him to immediately designate the angle of cut. The bevelling device is under perfect control, and can be set at any angle from nothing to 45 degrees, and reversed instantly.

The machine is heavy, perfectly proportioned and of sufficient floor space to insure steady running, with the blade set at any angle. An ingenious device (very sensitive under all conditions) controls the tension of the saw blade. Any of our readers who may be interested, can learn prices and full particulars by applying to the manufacturers, who will also be pleased to furnish their new illustrated catalogue free to principals and foremen.

MECHANICAL DRAFT.

Writing in the Engineering Magazine of the use of mechanical draft aboard ship, Mr. W. M. McFarland, now with the Westinghouse companies, but formerly one of the most active of the young engineers of the navy, says:

"We do not hear so much nowadays about boilers being damaged and trial trips lost on account of the use of forced draft, but about ten years ago this was a complaint not at all uncommon. A part of the reason for the change is the increased use of water tube boilers; but, nevertheless, the known fact that forced draft can be used within limits on any boiler with decided advantage is also an important factor in the matter. As already remarked, the advent of water tube boilers has removed this question of damage done to the tube ends by high rates of combustion from the region of practical consideration, owing to the fact that in well-designed boilers of this type, where there is any adequate provision for expansion, there has been no case of damaged tubes, how-

ever rapid the combustion. At the engineering congress held in Chicago in connection with the World's Fair, Mr. C. D. Mosher gave a report of a test of one of his boilers, where the air pressure was 12 inches of water, giving an evaporation of 18.2 pounds of water per square foot of heating surface. In the trials of a Ward boiler prior to its adoption for the U. S. S. Monterey, the rate of combustion was 55 pounds per square foot of grate for a period of 24 hours without any damage whatever, and in a short test of the boiler of the U. S. S. Cushing, with an air pressure of 4 inches of water, the rate of combustion was higher than 66 pounds per square foot of grate without any damage. Indeed this was one of the reasons which led to the readiness with which the water tube was accepted, although, of course, the prime reason was the reduction in weight."

SENATOR FRYE ON FOREIGN TRADE.

In a recent address before the Union League of Philadelphia on the general political and commercial situation, Senator Frye of Maine, said:

"All intelligent men know perfectly well to-day that in the foreign carrying trade we have nothing to do whatever; we are out of it. Our ships are never seen anywhere in the world. Four ships of the American Line carry the American flags that go across the water. That is about all there is to it. Last year, with all our enormous exports and imports to and from Europe, our ships did not carry quite 2 per cent., and in all the world they did not carry quite 9 per cent. The New York Produce Exchange, a few years ago, made a report, and in that report it said 1,750 ships cleared from the port of New York in that year for foreign markets, loaded with our products, and that seven of them carried the American flag. All of you know that, and in knowing it you are very apt to forget that we have such a thing as a lake, coastwise and river freight. We have the finest in the whole wide world. We have a larger one than Germany, France and England combined in the same trade. To-day our tonnage in that fleet of documented and undocumented vessels, will reach 7,000,000. The Suez Canal, which is supposed to carry the commerce of the world, passed, last year, a tonnage of nearly 10,000,000. The Sault Ste. Marie, in eight months of last year, passed a tonnage of 25,000,000—more than entered London or Liverpool in the same time. It took 3,500,000 tonnage to carry the freights on the Mississippi river alone last year. That fleet carried last year 168,000,000 of tons of freight and 200,000,000 of passengers. Your ships in the foreign carrying trade are unprotected and compete with ships that are protected. Your coastwise, lake and river fleet has been protected for a hundred years by absolute prohibition, no foreign ship being permitted to engage in it under any condition. There is the difference between protection and non-protection.

"How about the future? Are we going to acquire foreign markets in the future? Take your manufactured product alone, which competes with the world. Your manufactured product must meet all Europe, in all the markets of the world, you paying double the wages that they pay. Is there going to be a surplus of manufactured product? Last year we exported of manufactured product \$1,000,000 worth every day, and yet consumption at home was greater than it ever had been in any year in the history of this republic.

"Your most dangerous commercial rival in the next twenty-five years is Germany; indeed, she is the only rival you have any occasion to be afraid of, and you have occasion to be afraid of her. Her people are economical and very hard working. She patterns your machinery the moment you get it out of the inventor's hands to-day; she even patterns your goods, and in some instances puts them out as American goods.

She is determined upon having the markets of the world, and her emperor equally determined. She has facilities that we have not. Witness what they are doing to-day in establishing great lines to the great East! See what they mean by it! What do they mean by taking the Caroline islands from Spain? What do all their preparations to-day mean but a commercial war, more savage and more fierce than any that has yet been fought in our time? She does not pay half the wages to-day in making the identical goods that you make. Are you going to put your wages down to hers in order to compete with her? That would be a menace to the life of the republic itself.

"My judgment is that several things are to be done. In the first place, I believe that you ought to carry your exports and imports in American ships, under the American flag, with American masters. Make every master of an American ship an intelligent, active agent to find markets for your goods and to dispose of the goods when the markets are found. When you put a cargo of goods from Philadelphia in a British ship, do you expect the British master is going to help you dispose of those goods? He is going to hurt you in the disposition of those goods, if he can. The idea of our paying \$500,000 every day that we live, in gold, to England and Germany to carry our exports and bring our imports, is a humiliation that this American people ought not to submit to longer. About three years ago I thought I could see that the American people were taking a new interest in this matter of reviving American shipping, and thought it was a good time to try over again. I formed a committee on my own responsibility, because experts were an absolute necessity to making any kind of a business deal. I formed a committee of about twenty-five. From Philadelphia I took Mr. Clement A. Griscom, who knows pretty well about ships; I took Theodore C. Search as a repre-

sentative of the manufacturing industries; I took Charles Cramp as a ship builder; I took Mr. Mink, who has to do with the coastwise trade. I sent out to the lakes and took men there who had no earthly interest in the matter except as patriotic citizens. I took men who were engaged in the coastwise trade, who had no interest except as patriotic Americans. I took men who believed in discriminating differences. I took men who believed in bounties and made up a committee of twenty-five men, and there never were twenty-five men who devoted so much time to any one single piece of legislation as those men devoted to that. We finally drafted a bill which, in my judgment, will, if it becomes a law, put our flag upon the ocean once more."

STANDARD TYPES OF BOATS IN THE NAVY.

"Standard Types of Boats of the United States Navy" is the title of a valuable publication just issued from the construction bureau of the navy, having been compiled under the direction of Admiral Hichborn, chief constructor. American naval boats are the best and the swiftest in the world, and the American jacksies have proved their superiority in many memorable rowing contests with the boats of every naval power in every port in the world. This result has not been obtained without effort, but, as disclosed in the publication just issued, has followed from the utilization of the highest science in boat building, supplemented by the practical experience of our naval captains and of the sailors who pull the oars. At last the United States navy has thoroughly standardized its boats and the precious results have been embodied in the book, which is the first of its kind ever published by any navy.

The principal reason for the publication was a desire on the part of the navy department to provide in compact form all of the information necessary to enable any private boat builder to construct United States naval boats with absolute accuracy. It is realized that in time of war the navy yards, which now build the boats, could not begin to meet the demand, and recourse must be had to outside builders. In the Spanish-American war the navy was very near the end of its resources in the matter of boats. The army had used up all of the boats of the North Atlantic squadron in landing near Santiago, and had there been more naval operations after the destruction of Cervera's fleet the lack of boats would have been manifested. As a matter of fact it was only the forwardness of the construction bureau in building a number of boats for battleships and cruisers on the stocks in advance of their completion that enabled the department to have a small stock upon which to draw in the time of need.

The publication, which is intended to guard against a recurrence of this condition, sets out all of the details needed for the construction of any one of the type of naval boats so accurately that it would not be necessary for a boat builder even to take a measurement. Every figure has been calculated, and every particle of material entering into the boat is indicated, with its weight and cost. The requirements are set out in ninety-nine pages of text, and there are no less than 222 pages of illustrations, some being half-tone reproductions of the launches and gigs and whale-boats and steam cutters and dingies and other craft which make up the equipment of a warship.

ARMOR PLATE MAKING AT THE BETHLEHEM WORKS.

The Bethlehem Steel Co., South Bethlehem, Pa., has just issued an attractive little book intended to briefly illustrate the successive steps in the manufacture of armor plate, ordnance and forgings from the raw material to the finished product as practiced at the Bethlehem works. The story begins with the iron ore mines in Cuba and continues to the shipping wharves, the storage plant, the blast furnaces, the open hearth furnaces, and successively shows the manufacture of the steel ingot, the armor plate and the processes for hardening it. The book is beautifully illustrated. The result of several experiments in the penetration of armor is shown, together with various types of ordnance now used on battleships. Valuable statistics are also given of the world's production of coal, iron ore and iron and steel.

It is expected that within the next ten days the Harvard, first of the large freighters building by the American Ship Building Co. for Carnegie interests will be launched at the Detroit works. The Detroit works also have two very large steamers under way for Eddy Bros. of Bay City, and one of these will go into the water shortly after the Carnegie steamer. Work on a fire boat for the city of Detroit will be started as soon as the Harvard is launched.

Henry M. Curry, well known to everybody who has had dealings with the Carnegie Steel Co. during several years past, died at Atlantic City on Saturday last. Mr. Curry had been in poor health for some years and had not been in active business for many months. His death was due to a general breaking down of his system.

Chippewa is the name selected for the fast excursion steamer building at the works of the Craigs, Toledo, for the Arnold Transportation Co. of Mackinaw Island, Mich. This vessel is 209 feet over all and of very fine lines. She is to maintain a speed of 18 miles an hour in regular service.

THE KENNEY FLUSHOMETER

FOR FLUSHING WATER-CLOSETS.

THE BEST SYSTEM EVER INVENTED
FOR USE ON STEAM VESSELS.

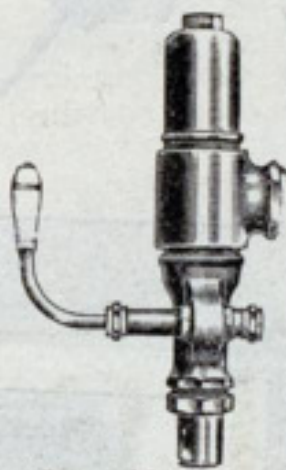
NO CUP LEATHERS OR SPRINGS.

Owners and Constructors of Steamships,
Yachts and Steamboats have found
it indispensable.

Used by the U. S. War and Navy Departments—Transports Grant, Sheridan, Burnside, Terry, Hooker, Thomas, Sedgewick, Meade, Crook, McClellan, Sherman. Also Albany, Day Line Steamers, and others.

THE KENNEY COMPANY,

Send for Catalogue. 72 to 74 Trinity Place, NEW YORK.

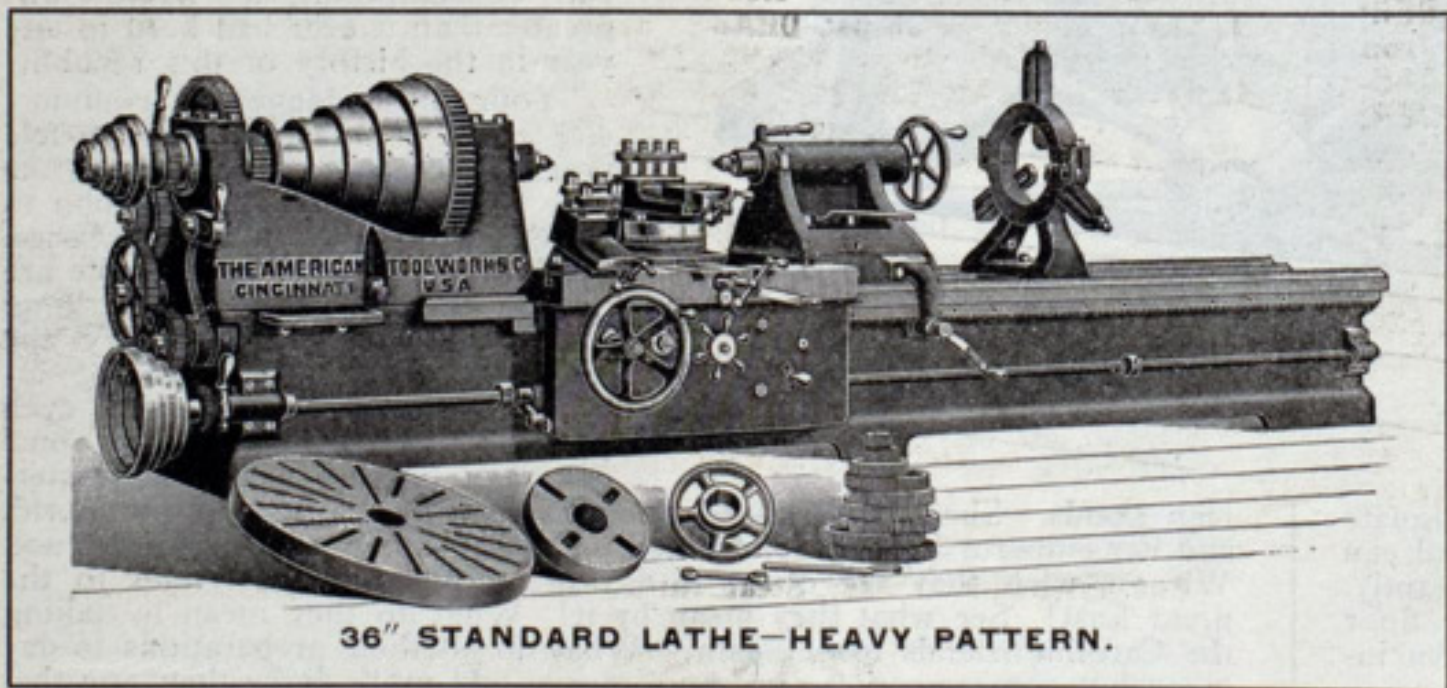


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36" STANDARD LATHE—HEAVY PATTERN.

We build complete lines of Machine Tools
for machine shop equipments, viz :

Lathes, Planers,
Drills, Shapers,
Boring Mills, Etc.

Investigate our lines before buying.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

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NEW YORK OFFICE: 120 Broadway,
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DENVER AND SALT LAKE CITY: The Mine & Smelter
Supply Co.

LONDON: Alfred Herbert, Ltd., 7 Leonard St.,
Finsbury, E. C.

DÜSSELDORF: de Fries & Co., Act. Ges.,
Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.

BERLIN: de Fries & Co., Act. Ges.,
Kloster Strasse, 13-15.

PARIS: Roux Frères & Cie., 54 Boulevard
du Temple.

MOSCOW: Alfred Stucken.

STATISTICS OF LAKE COMMERCE.

A systematic attempt to gather statistics of lake commerce is being put into operation by the chief of the bureau of statistics, treasury department. It is well known that efforts to compile these statistics from the clearances or manifests now filed by vessel masters have proven unsatisfactory, as the master in many cases is unable to state accurately his final destination when he makes out his clearance papers, while the manifests surrendered at the end of the voyage do not show additions to, or discharges of cargo en route, especially if made within the district where the manifest is surrendered; and even if these were satisfactory, statistical compilations from them would entail upon collectors a greater amount of labor than could be expected of them without additional force.

The bureau of statistics has therefore prepared a form of supplementary manifest which each vessel master is to file with his ordinary manifest at the end of each trip, showing the quantity of cargo received at the beginning of his trip, the amount received or discharged en route and the amount discharged at the port of final destination. These supplementary manifests will be filled out by the captains, delivered to the collectors at the end of the voyage, and by the collectors mailed to the bureau of statistics where the compilations will be made; and by this method, it is hoped, the experts of the bureau will be able to present a complete picture, month by month, of the traffic of each port and between all ports on the great lakes in the principal articles which enter into commerce. It is not expected by the bureau that these statements will at present include package or miscellaneous freight, except a simple statement as to total tonnage, but if it is able to present an accurate picture of the movement of the great articles entering into the commerce of the lakes, such as grain of the various classes, flour, iron ore, pig iron, copper, coal, stone, lumber etc., a long step will have been taken toward the establishment of a system of measurement of the commerce on the lakes and of each city or port upon the lakes.

The plan devised by the bureau of statistics has been submitted to collectors, engineer officers, vessel owners, the officers of the Lake Carriers' Association, and editors of marine publications, and in all cases approved by them, both because of its simplicity and the ease with which vessel masters will be able to supply the information required of them, and the further fact that its application will not in any way delay vessels, as the statement is to be filed at the end of the voyage, and the blanks which are to be supplied to masters can be readily filled out during the closing hours of the trip and filed with the ordinary manifest at the custom house, which the captain or his representative is, under present regulations, required to visit at the end of each trip. The form of this statement adopted by the bureau of statistics corresponds precisely with that used at the "Soo," with which most vessel masters on the lakes are already familiar, and thus their inconvenience in its use is reduced to a minimum, while the fact that the compilations are to be made by the bureau of statistics relieves the collectors of any inconvenience other than

that of seeing that the forms are properly filled out and filed by each vessel master at the end of each trip.

The compilation of the statistics thus gathered will be made under the direction of the chief of the bureau of statistics by Mr. Waldon Fawcett, formerly connected with the Marine Review of Cleveland, and with the marine columns of the Cleveland dailies.

LARGE FLOATING DOCK FOR BERMUDA.

The British admiralty has accepted the tender of Swan & Hunter, ship builders of Newcastle-on-Tyne, for a large floating dock at Hamilton, Bermuda. The designs have been drawn by Clark & Standfield, London, who were the designers also of the dock for Algiers, La., now building at Sparrow's Point, Md.; of the Havana naval dock, and the large commercial dock at Stettin, Germany. The Bermuda dock is to be 545 feet long, 100 feet wide and 33 feet depth of water on blocks. It will lift 17,000 tons as against 18,000 tons for the Algiers dock. The two are in most particulars similar. The cost of the Bermuda dock is to be £185,000, and it is to be completed within one year from date of contract, so that it may be towed out to Hamilton in August, 1901.

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, agent, Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67, June 4.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of May 9, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	37	38	36¾	37¾
American Steel & Wire, Pfd.....	76	77	76	76¾
Federal Steel	38	39¾	37¾	39
Federal Steel, Pfd.....	67¾	67¾	67	67¾
National Steel	29¾	31	29¾	31
National Steel, Pfd.....	87¾	87¾	87	87
American Tin Plate	25¾	25½	25	25½
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	20¾	22	20¾	22
American Steel Hoop, Pfd.....	71	72¾	71	72¾
Republic Iron & Steel	15¾	15¾	14¾	15
Republic Iron & Steel, Pfd.....	57	.....	.....	57

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat VOLTIGEUR; Squadron's Look-out Ship MILAN; Squadron's Look-out Ship HIRONDELLE; Gunboat CROCODILE; Despatch Boat ACTIF; Cruiser AMIRAL RIGAUD DE GENOUILLY; Iron Clad Cruiser ALGER; Iron Clad Cruiser LATOUCHE-TREVILLE; Iron Clad Cruiser CHANZY; Iron Clad Cruiser AMIRAL CHARNER; Tug ABERVRACH; Despatch Boat CAUDAN; Torpedo Despatch Boat LEGER; Torpedo Despatch Boat LEVRIER; Battleship BRENNUS; Protected Coast Guard AMIRAL TREHOUART; Iron Clad Cruiser BRUIX; Iron Clad Cruiser BUGEAUD; Cruiser DESCARTES; Battleship BOUVET; Cruiser POTHUAU; Cruiser GALILEE; Cruiser PASCAL; Cruiser CATINAT; Battleship CHARLEMAGNE; Cruiser LAVOISIER; Cruiser PROTET; Battleships GAULOIS, SAINT LOUIS and HOCHÉ; Iron Clad IENA; Cruiser DESAIX; Iron Clad Cruiser DUPETIT-THOUARS; Cruiser DUPEIX; Cruiser FURIEUX; Battleship NEPTUNE; Battleship DEVASTATION; Cruisers SULLY, AMIRAL AUBE and MARSEILLAISE.

MESSAGERIES MARITIMES: Cargo Steamer ORTEGAL; Mail Steamships SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LACIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers ANGERS, CAEN, BREST, CHERBOURG; Fast Steamers TAMISE, MANCHE, FRANCE.

RUSSIAN NAVY.

Iron Clad Frigate MININE; Gunboat GROZIASTCHY; Imperial Yacht MAREVO; Imperial Yacht STRELA; Gunboat GREMIASCHY; Gunboat OTVAJNI; Imperial Yacht TZAREWNA; Imperial Yacht STANDARD; Cruiser ROSSYA; School Ship VERNY; Cruiser SVETLANA; Cruiser DIANA; Cruiser PULLADA; Torpedo Transport Boat BAKAN; KHERSON and MOSKBA, Ships of the Volunteer Fleet; Gunboat GILACH; Iron Clad EKATERINA II; Gunboat KOUBANETZ; Cruiser AURORA; Iron Clad EMPEREUR NICOLAS I; Iron Clad PRINCE POTIEMKINE DE TAURIDE; Cruiser BAYAN; Iron Clad CESAREWITCH; Gunboats TERETZ and OURALETZ; Iron Clad BORODINOW; SMOLENSK, Ship of the Russian volunteer fleet; cruiser BOJARINE.

ENGLISH NAVY.

Torpedo Boat Destroyer SHARPSHOOTER; POWERFUL and TERRIBLE, iron clad cruisers; GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE, cruisers; NIOBE, DIADEM, ANDROMEDA, EUROPA, cruisers; CANOPUS, GLORY, GOLIATH, ALBION, OCEAN, iron clad ships; ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER and HYACINTH, cruisers; VENGEANCE, iron clad; ALBERT AND VICTORIA, royal yacht; CONDOR

and ROSARIO, sloops; CRESSY, ABOUKIR, SUTLEY and HOGUE, cruisers; IMPLACABLE, FORMIDABLE and IRRESISTIBLE, VENERABLE, LONDON, BULWARK, iron clad ships; EURYALUS, BACHANTE, cruisers; MUTINE, RINALDO, SHEARWATER, sloops; CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL, iron clad ships; DRAKE, KING ALFRED, LEVIATHAN, AFRICA, cruisers; VESTAL, sloop; MONMOUTH, cruiser; BEDFORD, cruiser; ESSEX, KENT, cruisers; ALBEMARLE, MONTAGUE, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; KAISER KARL VI, cruiser; X', X'', battleships.

ITALIAN NAVY.

VARESE, cruiser; BENEDETTO BRIN, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships PUERTO-HUERGO and MENDOZA.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; ALMIRATE LYNCH, torpedo boat destroyer; ALMIRANTE CONDELL, torpedo boat destroyer; GENERAL BAQUEDANO, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; CHIYODA, cruiser; ASAHI, iron clad; IWATE, cruiser; AZUMA, cruiser; HATSUSE, iron clad; ITSUKUSHIMA, iron clad coast guard; MIKASA, battleship.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers NORTH WEST and NORTH LAND, of 7,000 H. P. each; yachts SHEARWATER, CORYELL, WILD DUCK, SULTANA.

Cable Address: BELLEVILLE SAINT-DENIS-SUR-SEINE.

General Information Sent on Demand.

AROUND THE GREAT LAKES.

The steamer Langell Boys and consort Comstock have been sold to Eddy Bros. & Co. of Bay City. Capt. E. K. Hungerford will command the Langell Boys.

Officers of vessels managed by Chas. Lonsby, Mt. Clemens, Mich., are: Steamer—Ida E, Capt. Hiram Moore, Engineer Geo. Pelkey. Schooner—J. M. Spaulding, Capt. Robt. Pardy.

Officers of the steamer Thomas Davidson are Alexander Cleghorn master and John McMillan chief engineer, and of the Walter Va'l, R. C. Smith master and Thomas Martin chief engineer.

The Eastern elevator was sold by auction at Buffalo Tuesday and purchased by Frederick K. Quinn of Brooklyn. The price paid was \$285,350. It is not known for whom the elevator was bought.

A final hearing in the famous New York-Conemaugh collision case will take place before the United States supreme court on Monday next. Leading lawyers in the case are C. E. Kremer of Chicago, and Harvey D. Goulder of Cleveland.

Grant B. Wilkes, Board of Trade building, Buffalo, advertises for sale a large, newly-built floating elevator that is equipped with steam shovels, etc. The capacity is 12,000 bushels of grain per hour to canal boats or 7,000 bushels to cars.

The light-house tender Marigold is now equipped with a gas tank of over 15,000 cubic feet capacity. Light House Inspector Wilson of the eleventh district has started on a trip with the vessel and will charge numerous gas buoys in his district.

A breakwater to be constructed at South Chicago will make that port one of the best on Lake Michigan. The contractors, Hausler & Lutz, have been busy for months past building cribs to be sunk as soon as possible. The breakwater will be 4,400 feet long.

A marine and stationary engineers' exchange in charge of Peter Burns has been opened by the Marine Engineers' Beneficial Association of Buffalo at No. 10 Exchange street, corner of Main. It is proposed to furnish from this exchange engineers for steamships, yachts, tow boats or launches, and also for power, refrigerating, electric and hydraulic plants.

W. J. Symons, manager of the Marine Supply Co., Fairport, has put out quite a few novel advertisements of late. Ship masters use blotting pads. The kind given away by the Fairport concern is of the very best quality and is a blotter and calendar combined. In an advertisement elsewhere in this issue Mr. Symons has adopted a capstan as a sort of trade mark.

It has been decided by the present owners of the steamer Harlem, which was raised from her perilous position on the reefs of Isle Royale, Lake Superior, late last fall and towed down to the lower lakes and there given a thorough rebuild, to place her for the present on the route between Washburn, Wis., and Midland, Ont., in a newly organized Cana-

dian line of steamers. She is about to start upon her first trip. Capt. "Wash" Harrow, who had the honor of successfully conducting the wrecking operations upon the boat, will also have the honor of being her first commander under her new owners.

NAVAL WAR COURSE OF STUDY.

Capt. C. H. Stockton, president of the naval war college at Newport has prepared a memorandum of the course of instruction for the current year which has been approved by the navy department. The course will begin on June 1, and will cover a period of three months. Assistant Secretary of the Navy Hackett, who has direct charge of the college, will deliver an opening address on June 2.

According to the proposed memorandum, the first week will be devoted to a series of lectures by Capt. Mahan of the navy upon the art of war as demonstrated by Napoleon's early campaigns on land. The treatment of subjects connected with the main problem of the year will follow. This problem is one dealing with the defence of the northwest coast of the United States north of the Columbia river, and the protection of our insular possessions, Hawaii, Guam and the Philippines. The resources and strategical, topographical and hydrographical features of these coasts and waters will be closely studied and the defence of the country planned against an attack by a strong naval power. The history of all previous naval operations in the area of this problem will be brought out.

Lectures will be given on naval strategy by Capt. Mahan, on coast defence by Capt. Goodrich and on naval tactics by Capt. Taylor. Part of the time of these lectures will be devoted to various tactical problems, and the working out by the improved war game of Kriegspiel, of strategical, practical and single-ship questions of combat. Major Knight of the United States Engineers' School of Application, at Willets Point, N. Y., will deliver a lecture on submarine mines for harbor defence. Warfare by means of torpedo boats will be the subject of lectures by Lieut. Chandler of the navy. There will also be lectures on maritime international law by President Stockton, a part of which will be an explanation of the code of laws of war at sea.

The questions of the proper ships for the American navy and the proper organization, mobilization and expansion of the navy at the outbreak of war will be treated upon during the coming course. Surgeon Bayer of the navy will lecture upon the subject of navy hygiene and the care of men in tropical climates, ashore and afloat. The sea power of the principal naval countries of the world will also be treated in a series of lectures by officers of the college staff.

The Greenport Basin & Construction Co. was incorporated recently at Trenton, N. J. The purpose of the company is to build ships. The capitalization is \$75,000 and the incorporators are Charles Finney Brigham, Fred M. White and Charles L. Flack. Offices of the company are in the Corporation Trust building, Jersey City.

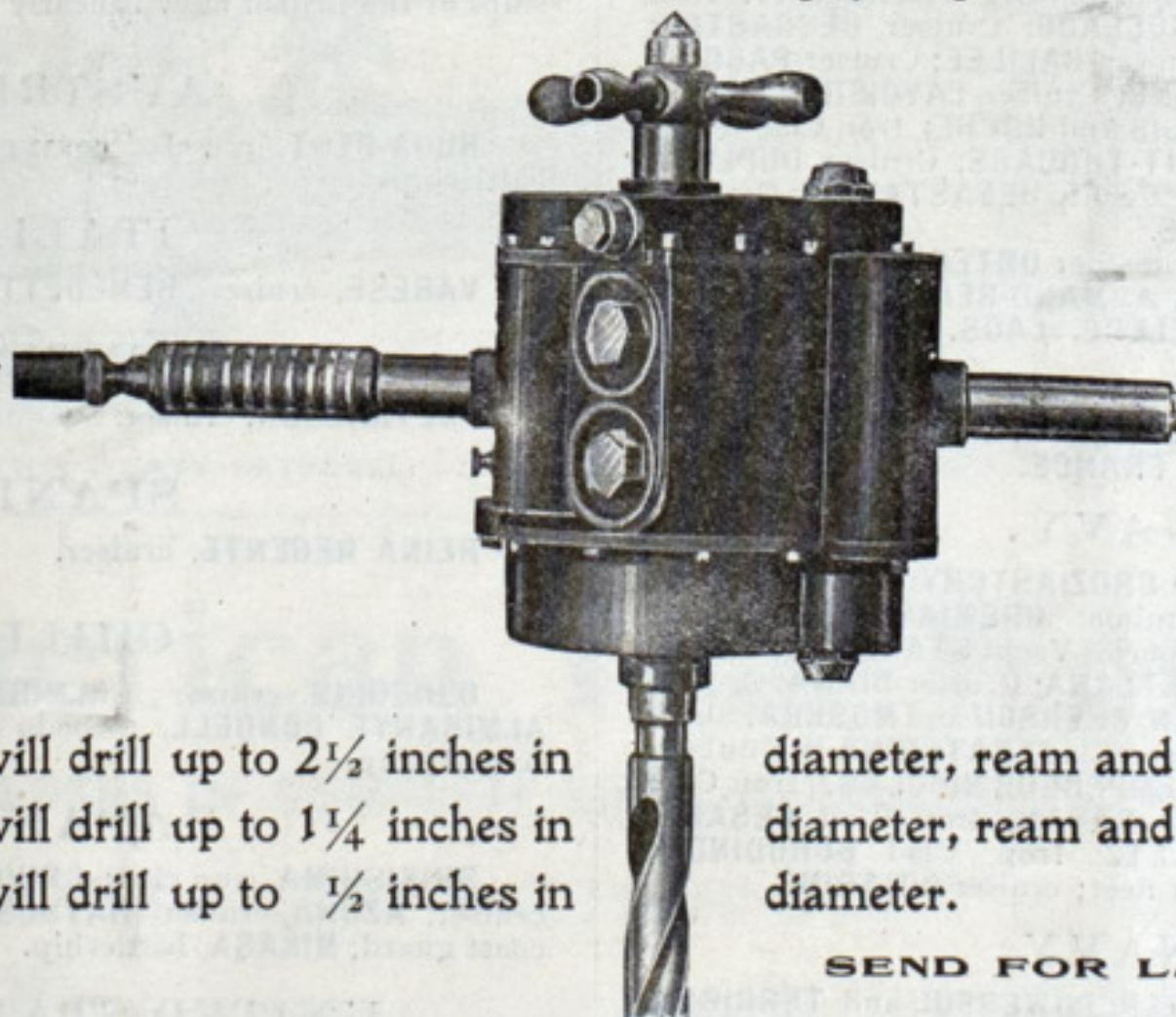
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TRADE NOTES.

Seymour N. Robinson, New York manager for the Berlin Iron Bridge Co., announces change of the New York office of the company to the St. Paul building, 220 Broadway.

Hale & Amory of Boston, architects, announce that they have established a department for the designing of joiner work and interior decoration of yachts and steamships with a branch office under the direction of Mr. Henry G. Morse, Jr., in the Drexel building, Philadelphia.

Miller, Bull & Knowlton, vessel owners and agents of 32 Broadway, New York, have been succeeded by A. H. Bull & Co. Mr. A. H. Bull purchased Mr. Henry T. Knowlton's interest in the old firm. Members of the new firm are Messrs. A. H. Bull, H. R. Killeen and Ernest M. Bull.

The Chicago Pneumatic Tool Co. reports that the 30th day of April closed the largest month they have ever had in business, both as regards the number of orders and the number of tools involved. This increase of trade extended to every country in Europe and to many places in the Orient. This company also reports that from the manner in which orders for May are coming in it will be necessary to run their factories to fullest capacity night and day.

The United States Metallic Packing Co. announce a change of location of their western office from 1003 Marquette building to 509 Great Northern building, Chicago. During the past year this company has furnished an unusual amount of metallic packings for both lake and sea going vessels. The users of these packings include nearly every ship builder on the coasts, gulf and lakes. In addition the company has supplied 11,183 locomotive packings. Mr. Albert J. Zwart is the western agent.

The Eagle Oil & Supply Co., 104 Broad street, Boston, makes Eagleine asbestos sheet packing, which they say is compounded for high and low pressures, and will not blow out, harden or crack, and is not affected by ammonia, oil, steam or alkalis. It is made in thicknesses of 1/32, 1/16, 3/32, 1/8, 3/16, and 1/4 inch. The company will give free to any engineer who mentions this publication and orders this month a square yard of any thickness of Eagleine asbestos sheet packing a nickel-plated 6-inch outside and inside registering caliper.

Buildings for the new works of the Seaboard Steel Casting Co. on the Delaware river front at Chester, Pa., will soon be well under way. A contract for the erection of a very large steel building has just been awarded to the McClintic, Marshall Construction Co. of Pottstown, Pa. The main foundry building will be 560 feet in length, 110 feet in width, and will be steel framed, with brick curtain walls. The machine shop is 80 by 300 feet, with an annex for a power house in which will be installed the boilers, engines and electrical machinery.

The B. F. Sturtevant Co., Boston, has just issued the third edition of bulletin H., devoted to special types of Sturtevant electric fans. One of them, an 8-pole circular-frame open-type suspended fan, is designed

to be supported immediately beneath the deck on shipboard, and to be used for purposes of ventilation. The motor is of the 8-pole type, the shaft being supported on tripod hanger bearings. The entire motor is supported by lugs and is made adjustable above the center to suit any direction or discharge of the fan. A receiving vessel is provided for the oil which escapes from the bearings and which is thus prevented from spreading over the surface of the machine.

M. T. Davidson, 133 Liberty street, New York city, recently shipped two distilling plants to Cape Nome, Alaska, where they will be used at the United States Army Station for making fresh water from sea water, for drinking and other purposes. The plants have a capacity of 1,200 gallons a day each, and are complete with boilers, evaporators, distillers, filters, feed-water heaters, and all necessary pumps and piping. Before being shipped they were set up at the Davidson shops in Brooklyn, N. Y., and tested under the direction of an army engineer, with most satisfactory results. At present the supply of fresh water available at Cape Nome for drinking purposes is limited and of a very poor quality. It is sold at the rate of two glasses for twenty-five cents, and formerly cost twenty-five cents a glass.

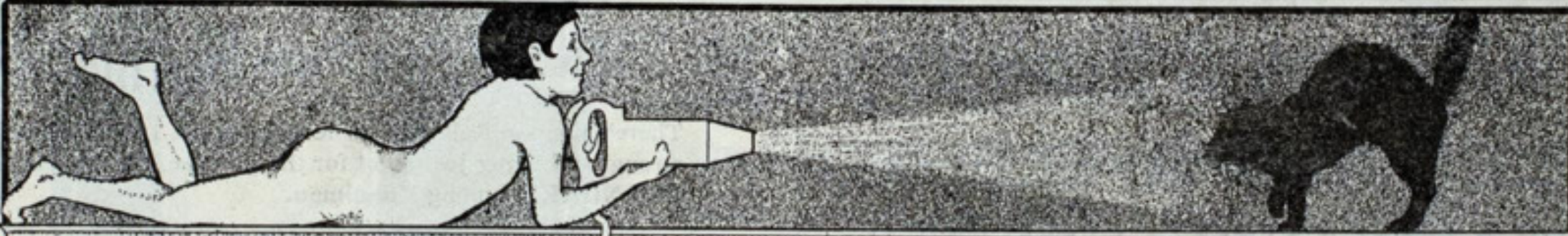
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of Northern Illinois, Wisconsin, Minnesota and Michigan there are hundreds of the most charming summer resorts awaiting the arrival of thousands of tourists from the south and east. Among the list of nearby places are Fox lake, Delavan, Lauderdale, Waukesha, Oconomowoc, Palmyra, the Dells at Kilbourn, Elkhart and Madison, while a little further off are Minocqua, Star lake, Frontenac, White Bear, Minnetonka and Marquette on Lake Superior.

For pamphlet of "Summer Homes for 1900," or for copy of our handsomely illustrated summer book, entitled "In the Lake Country," apply to nearest ticket agent or address with four cents in postage, George H. Heafford, general passenger agent, Old Colony building, Chicago, Illinois. May 24.

Over 8,700 tons of steel rails will be carried in the British steamer Samoa, now loading at Sparrow's Point, Md., for Vladivostok, Siberia. This is the largest cargo of rails ever loaded at an American port.

The change of time on the Nickel Plate road—Only a slight change at any of our stations. No. 4 leaves Chicago at 3:30 p. m. and departs from intermediate stations about thirty minutes later than formerly. Individual club luncheon and supper in dining car Chicago to Bellevue. Improvement in through sleeping car service both east and west. Club breakfast and lunch is served in dining car, Bellevue to Chicago on No. 1. Dining car service on Nos. 2 and 3 in both directions between Chicago and Buffalo. All trains daily. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 72, June 5



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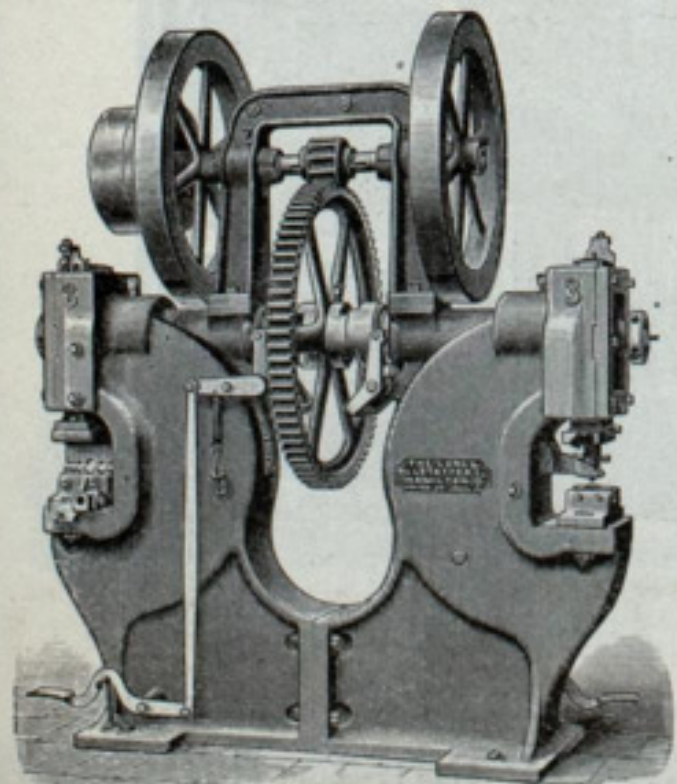
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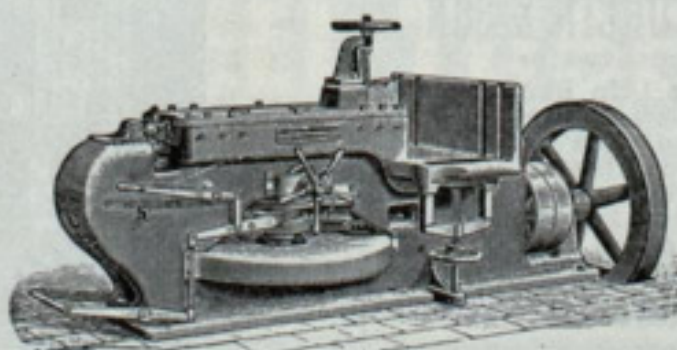
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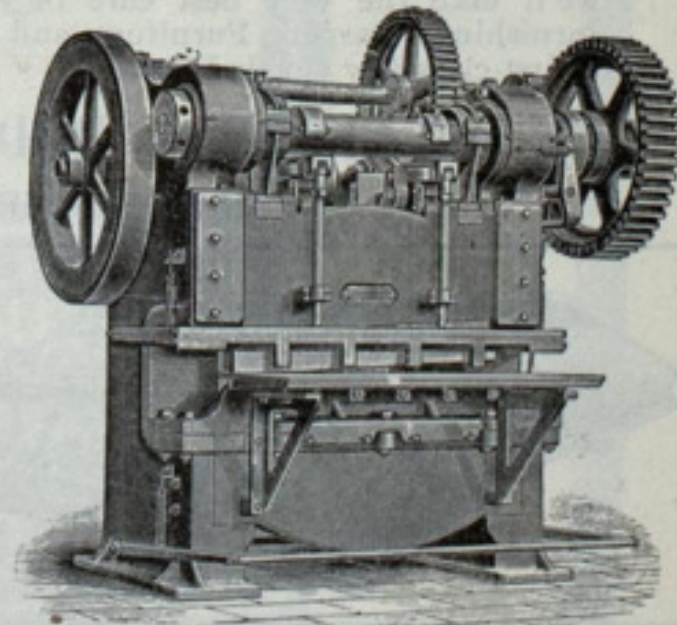
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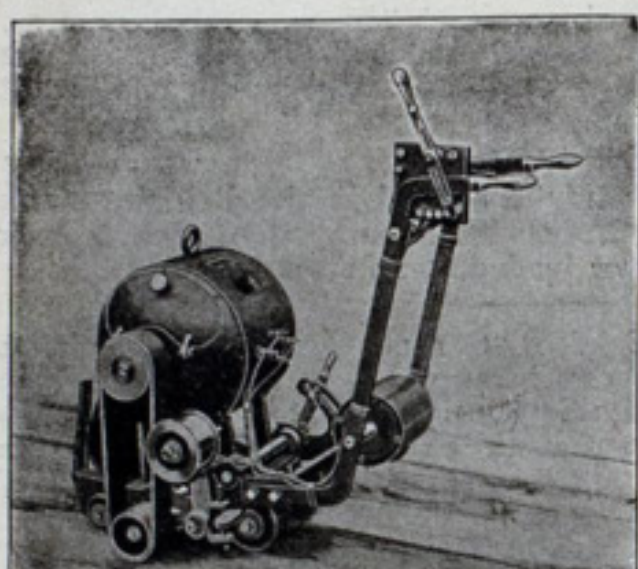


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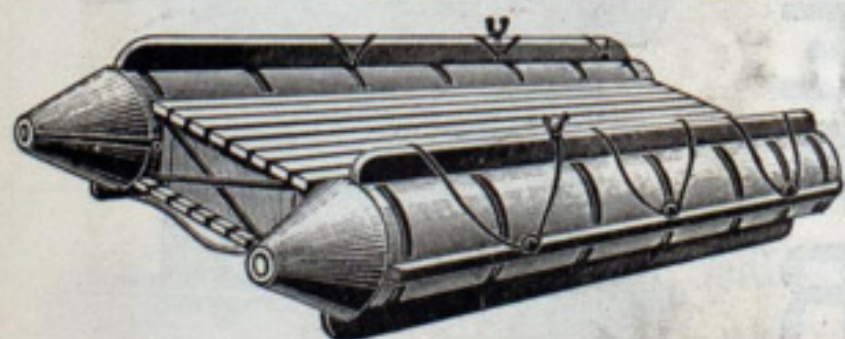
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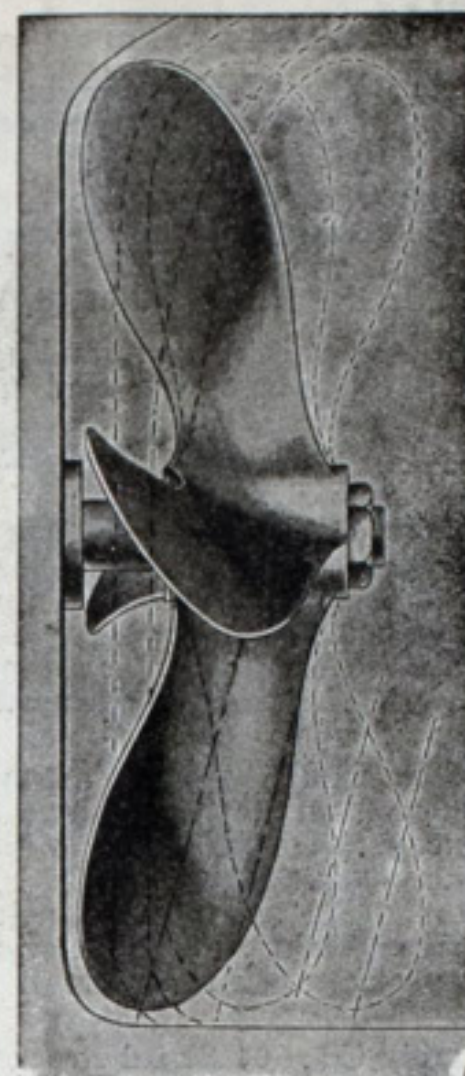
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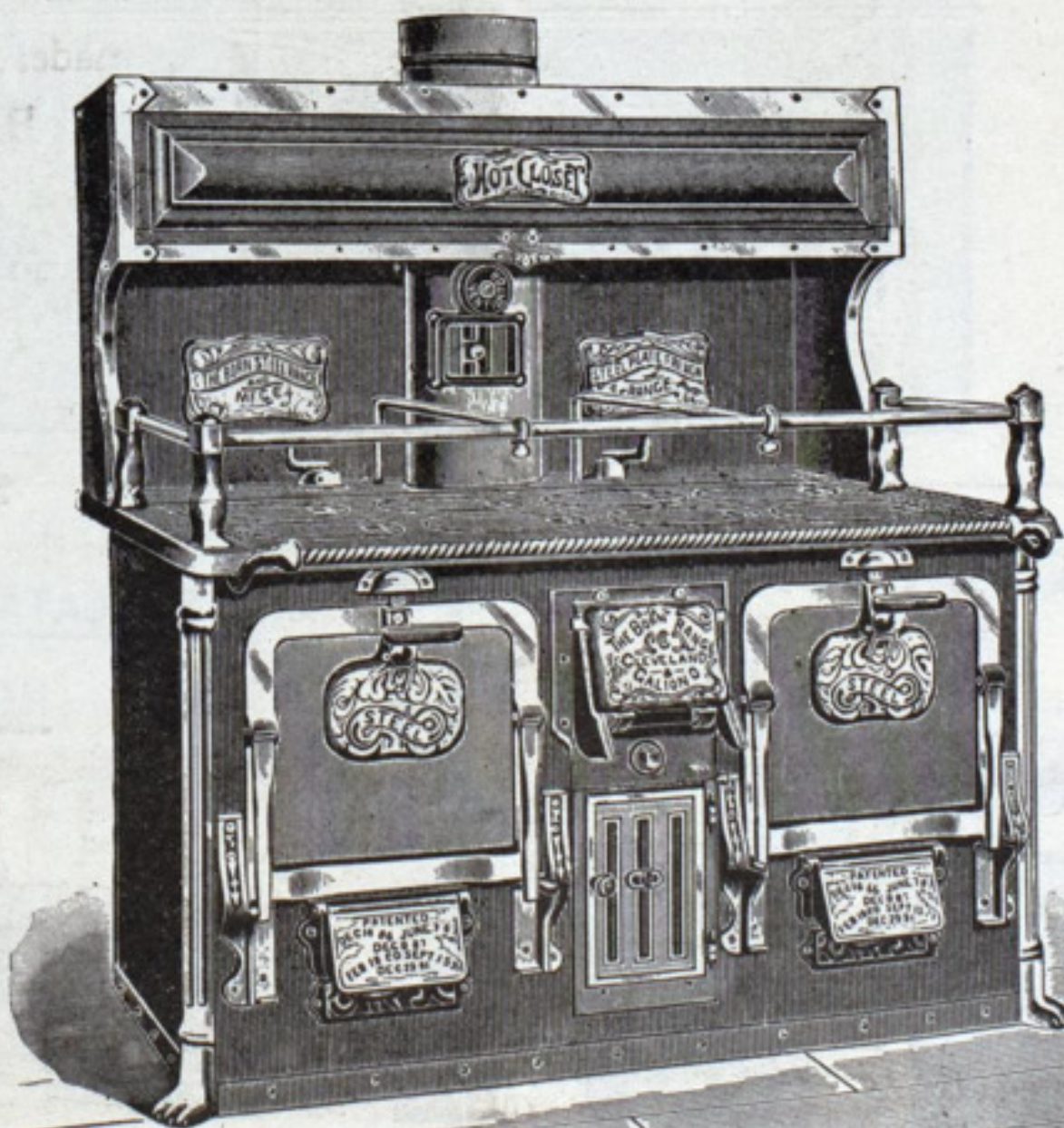
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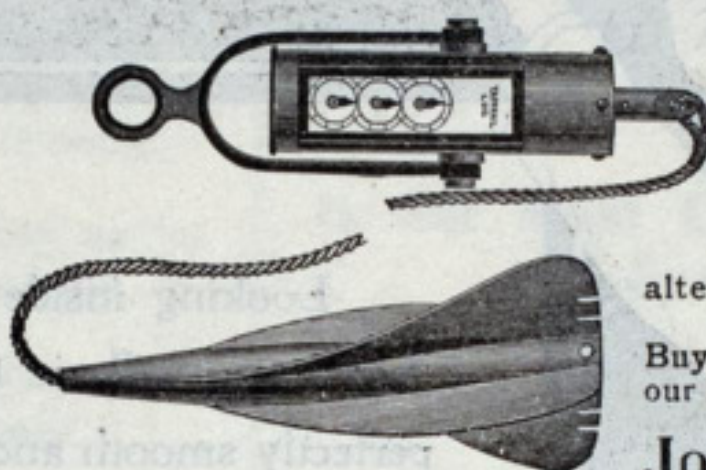
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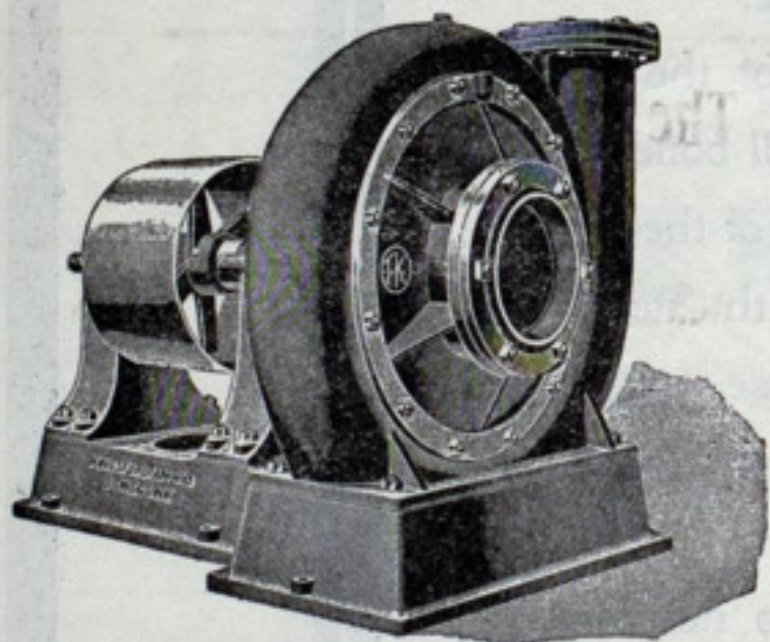
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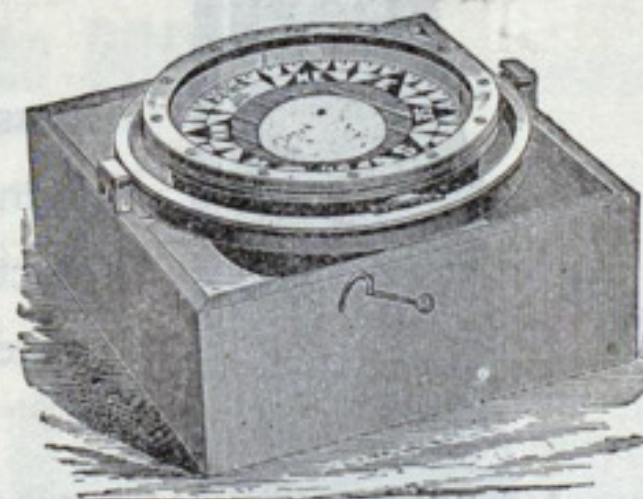


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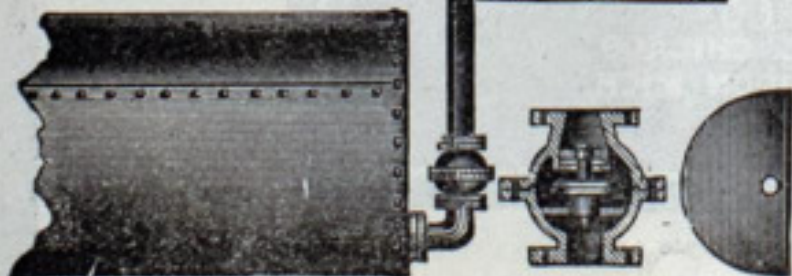
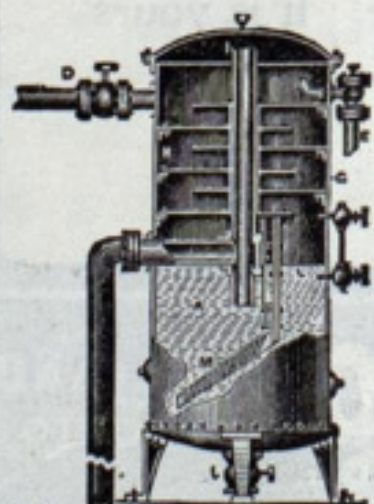
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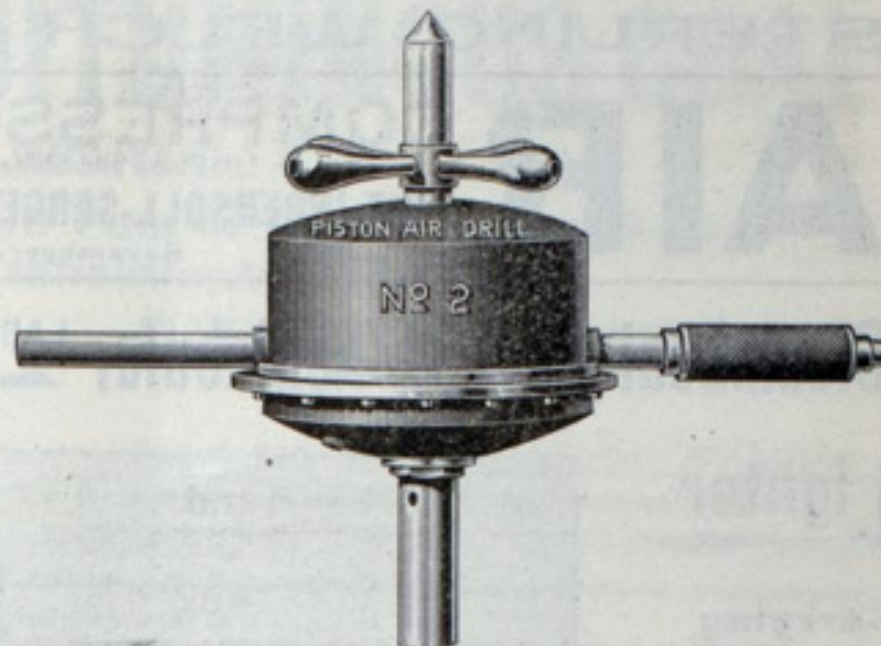
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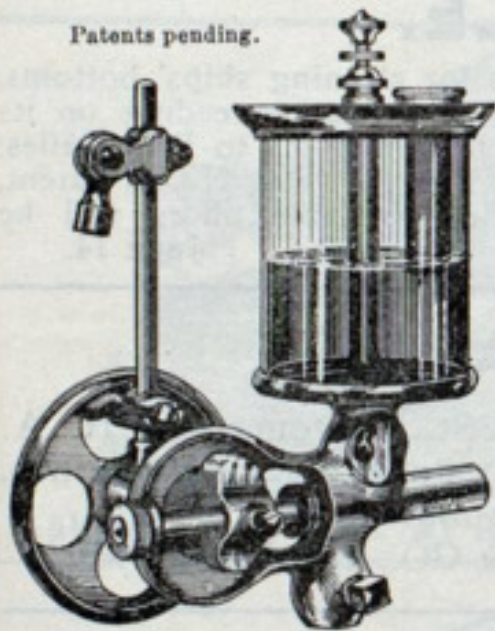
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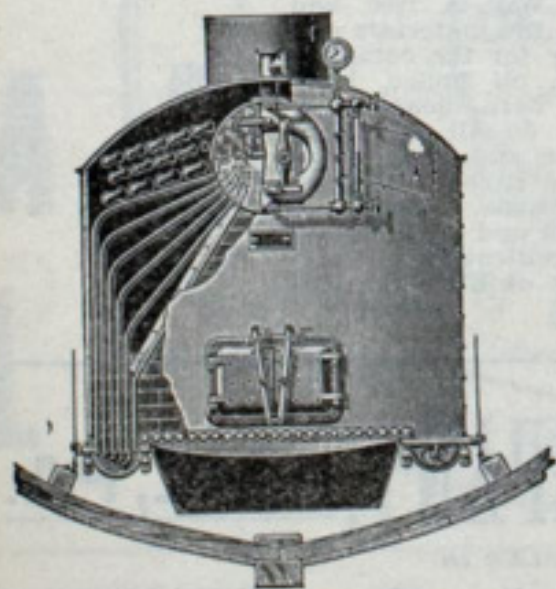
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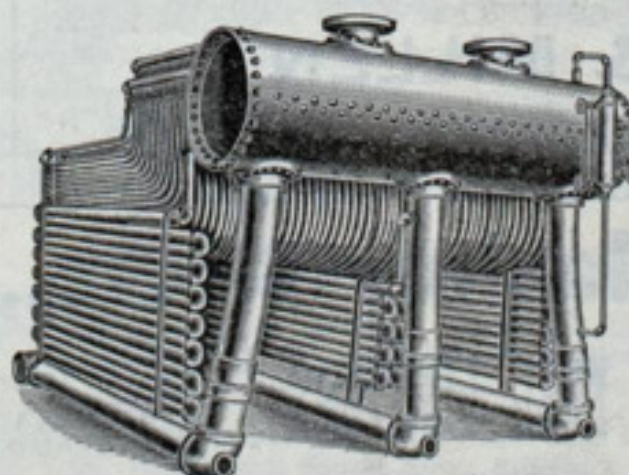
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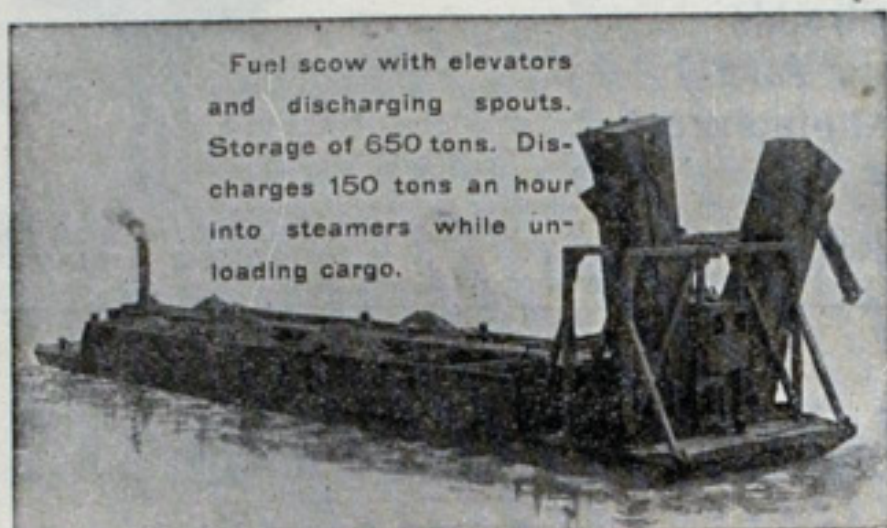
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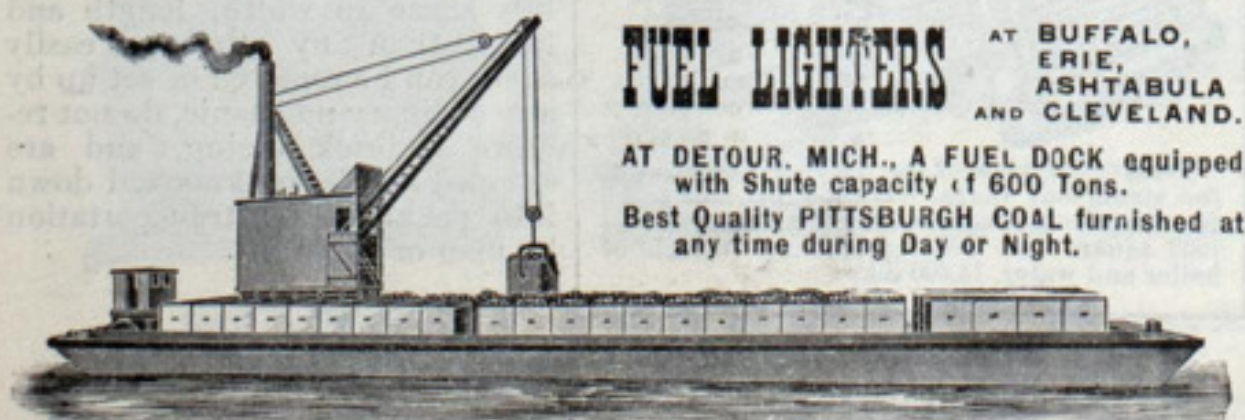
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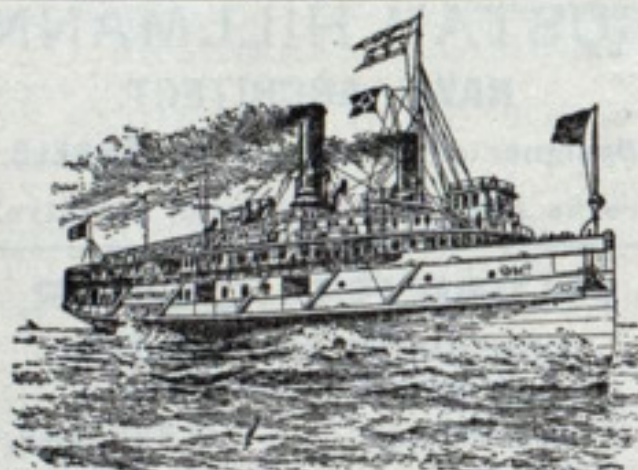
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Kingsford Found'y & Machine Works.....Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.
Newport News Ship Bldg. Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co.....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

BOILER TUBES, SEAMLESS, WELDLESS—Steel, Brass and Copper.

Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co.....New York.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Ajax Metal Co.....Philadelphia.
Cory, Chas. & Son.....New York.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.

BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co.....Cleveland.
McMyler Mfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Lebanon Chain Works.....Lebanon, Pa.
Monongahela Iron & Steel Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

CIRCULATOR EQUILIBRIUM,

with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co.....Cleveland.
Lidgerwood Mfg. Co.....New York.
McMyler Mfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co.....Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
McMyler Mfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Webster, Camp & Lane Machine Co.....Akron, O.
Westinghouse Electric & Mfg. Co.....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Manning, Maxwell & Moore.....New York.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.
Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mfg. Co.....Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mfg. Co.....Pittsburgh, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury
& Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.
Newport News Ship Bldg Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

FLUSHOMETERS.

Kenney, The Co.....New York.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
 Graham, James & Co.....Detroit.
 Hanna, M. A. & Co.....Cleveland.
 Pickands, Mather & Co.....Cleveland.
 Pittsburgh Coal Co.....Cleveland.
 Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
 Smith, Stanley B. & Co.....Detroit.
 Scott Co., W. L.....Erie, Pa.
 Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Giddings & Stevens.....Rockford, Ill.
 McMyler Mfg. Co.....Cleveland.
 Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gage & Valve Co.....Boston.
 Manning, Maxwell & Moore.....New York.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
 Philadelphia Pneumatic Tool Co.....Philadelphia.
 Q. & C. Co.....Chicago.
 Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.

Bement, Miles & Co.....Philadelphia.
 Chase Machine Co.....Cleveland.

HEATING APPARATUS.

Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
 Brown Holsting & Conveying Mach. Co.....Cleveland.
 Chase Machine Co.....Cleveland.
 Donohue & Co., John T.....Baltimore.
 Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....New York.
 Hodge, S. F. & Co.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Lidgerwood Mfg. Co.....New York.
 Manning, Maxwell & Moore.....New York.
 McMyler Mfg. Co.....Cleveland.
 Marine Iron Co.....Bay City.
 Sprague Electric Co.....New York.
 Westinghouse Electric & Mfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Ashcroft Mfg. Co.....New York.
 Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.

Jenkins Bros.....New York.
 Hayden & Derby Mfg. Co.....New York.
 Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.

Brown & Co.....Buffalo.
 Drake & Maytham.....Buffalo.
 Elphicke, C. W. & Co.....Chicago.
 Gibbs & Joys.....Milwaukee.
 Hawgood & Moore.....Cleveland.
 Hutchinson & Co.....Cleveland.
 Keith, J. G. & Co.....Chicago.
 La Salle & Co.....Duluth.
 Mitchell & Co.....Cleveland.
 Myers, James A.....Chicago.
 Osborn & Co., F. H.....Chicago.
 Pauly, H. J.....Milwaukee.
 Parker & Miller.....Detroit.
 Peck, Chas. E. & W. F.....New York and Chicago.
 Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
 Hanna, M. A. & Co.....Cleveland.
 Pickands, Mather & Co.....Cleveland.

LATHES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Manning, Maxwell & Moore.....New York.

LAUNCHES—NAPHTHA, ELECTRIC.

Electric Boat Co.....New York.
 Gas Engine & Power Co.....New York.

LIFE BOATS—METALLIC.

Dreln, Thos. & Son.....Wilmington, Del.
 Kahnweiler's Sons, D.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.
 Dreln, Thos. & Son.....Wilmington, Del.
 Kahnweiler's Sons, D.....New York.
 Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.

LUBRICATING PUMPS.

Manzel Bros.....Buffalo.
 Phenix Metallic Packing Co.....Chicago.
 Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Manning, Maxwell & Moore.....New York.

MACHINE TOOLS (WOOD WORKING).

Egan Co., The.....Cincinnati.
 Fay, J. A. & Co.....Cincinnati.
 Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
 Mechanical Fabric Co.....Providence, R. I.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
 Phenix Metallic Packing Co.....Chicago.
 U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Ajax Metal Co.....Philadelphia.
 Cramp, Wm. & Sons.....Philadelphia.
 Illinois Smelting & Refining Works.....Chicago.
 Magnolia Metal Co.....New York.
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Manning, Maxwell & Moore.....New York.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.
 Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.

Curr, Robert.....Cleveland.
 Hillman, Gustav.....Brooklyn.
 See, Horace.....New York.
 Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.

Bethlehem Steel Co.....So. Bethlehem, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Jos.....Jersey City, N. J.
 Standard Oil Co.....Cleveland.

PACKING.

Jenkins Bros.....New York.
 Katzenstein, L. & Co.....New York.
 Phenix Metallic Packing Co.....Chicago.
 U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
 Smith, Edward & Co.....New York.
 Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Egan Co., The.....Cincinnati.
 Fay, J. A. & Co.....Cincinnati.
 Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Manning, Maxwell & Moore.....New York.

PLANING MILL MACHINERY.

Egan Co., The.....Cincinnati.
 Fay, J. A. & Co.....Cincinnati.
 Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.

Ellis Marine Plumbing Co.....New York.
 Mott Iron Works, J. L.....New York.
 Sands, Alfred B. & Son.....New York.
 Kenney, The Co.....New York.

PNEUMATIC TOOLS.

Chicago Pneumatic Tool Co.....Chicago.
 Manning, Maxwell & Moore.....New York.
 Philadelphia Pneumatic Tool Co.....Philadelphia.
 Q. & C. Co.....Chicago.
 Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bath Iron Works Ltd.....Bath, Me.
 Case, A. Wells & Son.....Highland Park, Conn.
 Cramp, Wm. & Sons.....Philadelphia.
 Detroit Shipbuilding Co.....Detroit.
 Farrar & Trefits.....Buffalo.
 Fore River Engine Co.....Weymouth, Mass.
 Hardy, John B.....Tacoma, Wash.
 Hyde Windlass Co.....Bath, Me.
 Harlan & Hollingsworth Co.....Wilmington, Del.
 Hodge, S. F. & Co.....Detroit.
 Jenks Ship Building Co.....Port Huron, Mich.
 MacKinnon Mfg Co.....Bay City, Mich.
 Maryland Steel Co.....Sparrow's Point, Md.
 Moran Bros. Co.....Seattle, Wash.
 Morse Iron Works & Dry Dock Co.....Brooklyn.
 Neafie & Levy Ship & Eng. Bldg Co.....Philadelphia.
 Newport News Ship Bldg. Co.....Newport News, Va.
 Nixon, Lewis.....Elizabeth, N. J.
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
 Pusey & Jones Co.....Wilmington, Del.
 Risdon Iron Works.....San Francisco.
 Sheriffs Mfg. Co.....Milwaukee.
 Trigg, Wm. R. Co.....Richmond, Va.
 Trout, H. G.....Buffalo.
 Union Iron Works.....San Francisco.
 Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....Schenectady, N. Y.
 Rushmore Dynamo Works.....Jersey City, N. J.
 Sprague Electric Co.....New York.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co.....New York.
 Davidson, M. T.....Brooklyn, N. Y.
 Donohue & Co., John T.....Baltimore.
 Kingsford Foundry & Machine Works.....Oswego, N. Y.
 Van Duzen, The E. W. Co.....Cincinnati.
 Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Cleveland Punch & Shear Works Co.....Cleveland.
 Long & Allstatter Co.....Cincinnati.
 Manning, Maxwell & Moore.....New York.
 New Doty Mfg. Co.....Janesville, Wis.
 Wood & Co., R. D.....Philadelphia.

RANGES, KITCHEN OUTFITS.

Born Steel Range & Mfg. Co.....Cleveland.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.
 Champion Rivet Co.....Cleveland.

RUBBER INSULATED WIRES.

Roebbling's Sons, John A.....New York and Cleveland.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Consolidated Safety Valve Co.....New York.
 Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
 Upson-Walton Co.....Cleveland.
 Wilson & Silsby.....Boston.

SALVAGE COMPANIES.

See wrecking companies.

SCREW MACHINES.

American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Manning, Maxwell & Moore.....New York.

SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....Schenectady, N. Y.
 Rushmore Dynamo Works.....Jersey City, N. J.
 Sprague Electric Co.....New York.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).

Keystone Engine & Machine Works.....Philadelphia.

SHAPERS.

American Tool Works Co. (The).....Cincinnati.
 Manning, Maxwell & Moore.....New York.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bath Iron Works, Ltd.....Bath, Me.
 Cramp, Wm. & Sons.....Philadelphia.
 Craig Ship Building Co.....Toledo, O.
 Chicago Ship Building Co.....Chicago.
 Detroit Shipbuilding Co.....Detroit.
 Fore River Engine Co.....Weymouth, Mass.
 Hardy, John B.....Tacoma, Wash.
 Harlan & Hollingsworth Co.....Wilmington, Del.
 Iowa Iron Works.....Dubuque, Ia.
 Jenks Ship Building Co.....Port Huron, Mich.
 Maryland Steel Co.....Sparrow's Point, Md.
 Moran Bros. Co.....Seattle, Wash.
 Morse Iron Works & Dry Dock Co.....Brooklyn.
 Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.
 Newport News Ship Bldg. Co.....Newport News, Va.
 Nixon, Lewis.....Elizabeth, N. J.
 Pusey & Jones Co.....Wilmington, Del.
 Risdon Iron Works.....San Francisco.
 Roach's Ship Yard.....Chester, Pa.
 Townsend & Downey Ship Bldg. Co.....New York.
 Trigg, Wm. R. Co.....Richmond, Va.
 Union Dry Dock Co.....Buffalo.
 Union Iron Works.....San Francisco.
 Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
 Marine Supply Co.....Fairport Harbor, O.
 Moran, Bros. Co.....Seattle, Wash.
 Upson-Walton Co.....Cleveland.

SLING FRAME FOR HANDLING BARRELS.

Patriarche, H. R.....Milwaukee.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLT IRON, HOLLOW AND SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
 American Line.....New York.
 International Nav. Co.....Philadelphia.
 Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
 Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
 American Ship Building Co.....Cleveland.
 Chase Machine Co.....Cleveland.
 Detroit Shipbuilding Co.....Detroit.
 Donohue & Co., John T.....Baltimore.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Queen City Engineering Co.....Buffalo.
 Sheriffs Mfg. Co.....Milwaukee.

STOKERS FOR MARINE SERVICE.
 American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.
 Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
 Baldt Anchor Co.....Chester, Pa.
 International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
 Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
 Curr, Robert.....Cleveland.
 Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
 Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
 Hunt, Robert W. & Co.....Chicago.
 Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.
 Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
 Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
 American Tool Works Co. (The).....Cincinnati.
 Bement, Miles & Co.....Philadelphia.
 Chicago Pneumatic Tool Co.....Chicago.
 Cleveland Punch & Shear Works Co.....Cleveland.
 Long & Allstatter, The Co.....Hamilton, O.
 Manning, Maxwell & Moore.....New York.

New Doty Mfg. Co.....Janesville, Wis.
 Philadelphia Pneumatic Tool Co.....Philadelphia.
 Q. & C. Co.....Chicago.
 Standard Pneumatic Tool Co.....Chicago.
 Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.
 Egan Co., The.....Cincinnati.
 Fay, J. A. & Co.....Cincinnati.
 Woods Machine Co., S. A.....So. Boston.

TRUCKS.
 Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
 American Ship Windlass Co.....Providence, R. I.
 Chase Machine Co.....Cleveland.

TOWING COMPANIES.
 Calvin Co., The.....Kingston, Ont.
 Donnelly Salvage & Wrecking Co.....Kingston, Ont.
 Swain Wrecking Co.....Detroit.

TUBING, STEEL, COPPER AND BRASS.
 Atlantic Tube Co.....Pittsburg.
 Hungerford Brass & Copper Co., U. T.....New York.
 Merchant & Co., Inc.....Philadelphia.
 Shelby Steel Tube Co.....Cleveland.

VALVES, STEAM SPECIALTIES, ETC.
 American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gage & Valve Co.....Boston.
 Jenkins Bros.....New York.
 Manning, Maxwell & Moore.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
 Smith, Edward & Co.....New York.

VARNISH PAINT.
 Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
 Boland, John J.....Buffalo.
 Brown & Co.....Buffalo.
 Bull & Co., A. H.....New York.
 Drake & Maytham.....Buffalo.
 Elphicke, C. W. & Co.....Chicago.
 Gibbs & Joys.....Milwaukee.
 Hall & Root.....Buffalo.
 Hawgood & Moore.....Cleveland.
 Holmes, Samuel.....New York.
 Hutchinson & Co.....Cleveland.
 Keith, J. G. & Co.....Chicago.
 Mitchell & Co.....Cleveland.
 Moffat & O'Brien.....San Francisco.
 Myers, James A.....Chicago.
 Pauly, H. J.....Milwaukee.
 Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
 Buffalo Forge Co.....Buffalo.
 Sprague Electric Co.....New York.
 Sturtevant Co., B. F.....Boston.

WIRE ROPE.
 American Steel & Wire Co.....Chicago.
 Baker, H. H. & Co.....Buffalo.
 Roebling's Sons, John A.....New York and Cleveland.
 Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
 American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
 American Ship Windlass Co.....Providence, R. I.
 American Ship Building Co.....Cleveland.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.

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 American Ship Windlass Co.....Providence, R. I.
 Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
 Egan Co., The.....Cincinnati.
 Fay, J. A. & Co.....Cincinnati.
 Woods Machine Co., S. A.....So. Boston.

WORM GEARING.
 Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
 Calvin Co., The.....Kingston, Ont.
 Donnelly Salvage & Wrecking Co.....Kingston, Ont.
 Playfair's Barge & Tug Line.....Midland, Ont.
 Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
 Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
 Drein, Thos. & Son.....Wilmington, Del.
 Electric Boat Co.....New York.
 Gas Engine & Power Co.....New York.
 Lane & DeGroot.....Brooklyn.

YACHT, MARINE AND SHIPS' BELL CLOCKS.
 Ashton Valve Co.....Boston.
 Bliss, John & Co.....New York.
 Chelsea Clock Co.....Boston.
 Ritchie, E. S. & Sons.....Brookline, Mass.

YAWLS.
 Drein, Thos. & Son.....Wilmington, Del.
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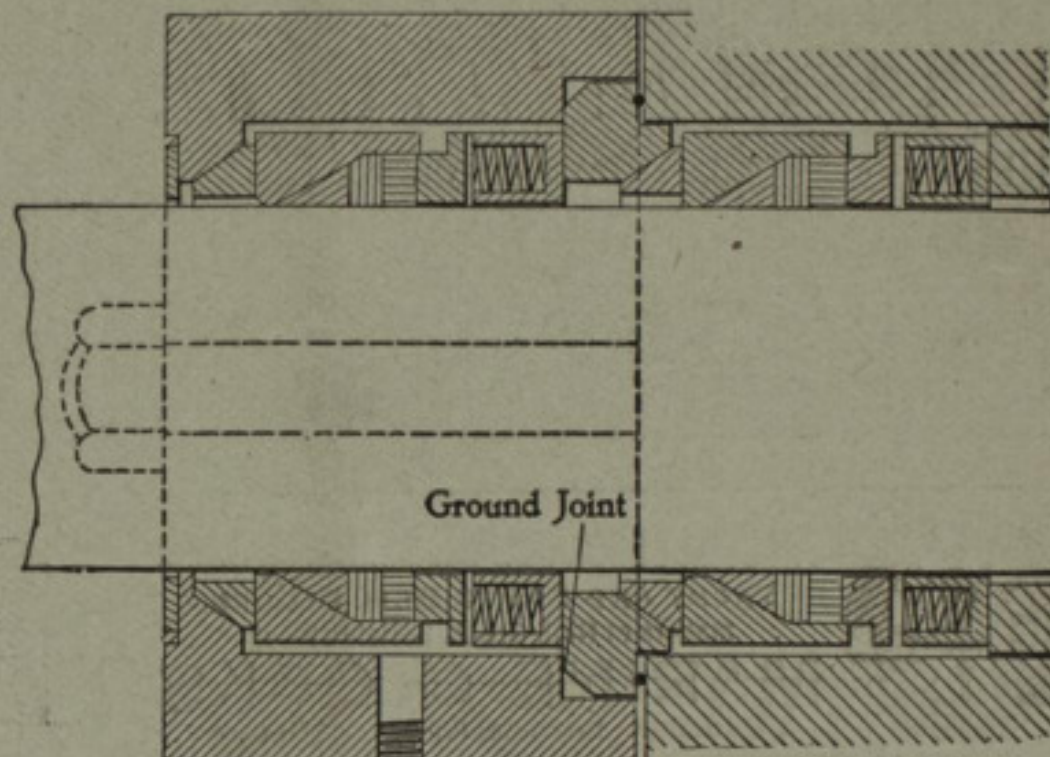
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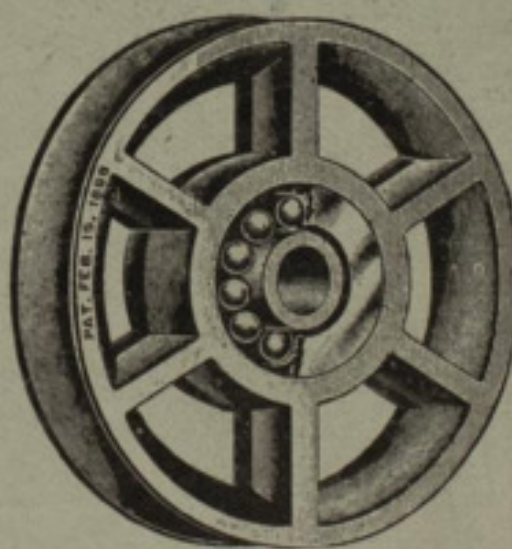
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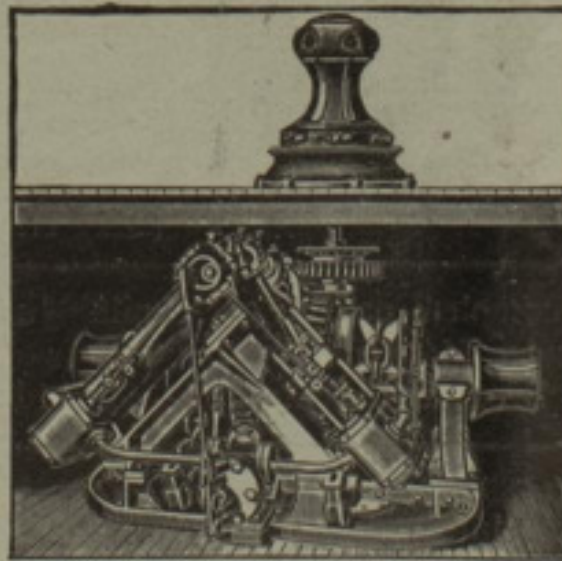
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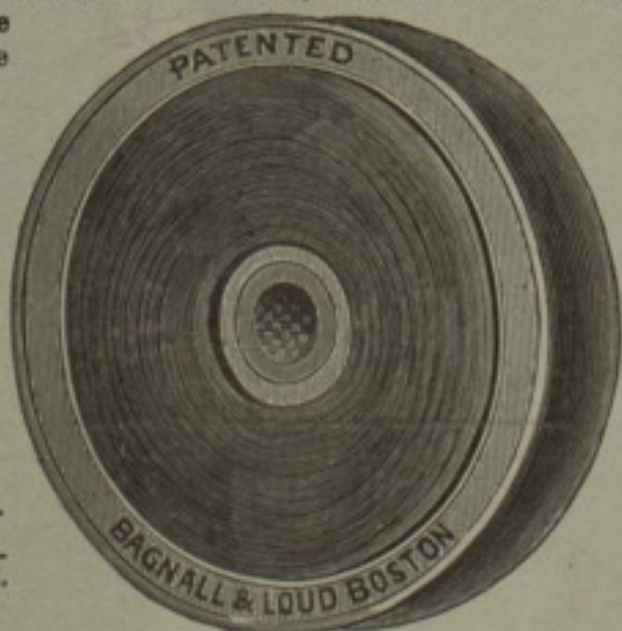
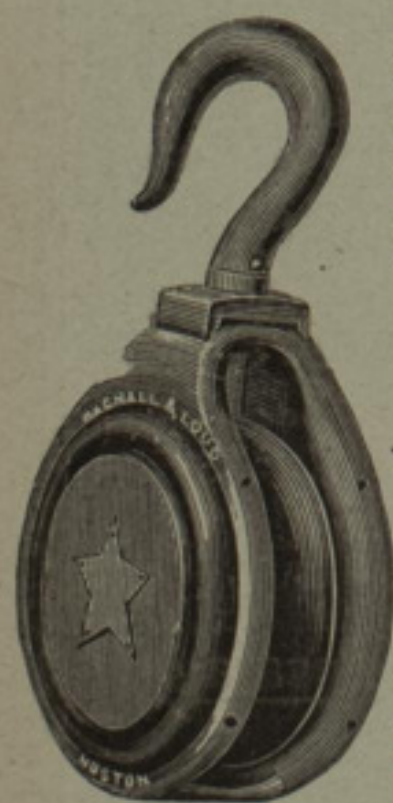
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MARINE REVIEW

VOL. XXI.

CLEVELAND, O., MAY 10, 1900.

No. 19.



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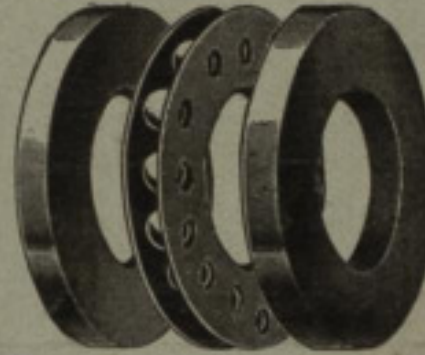
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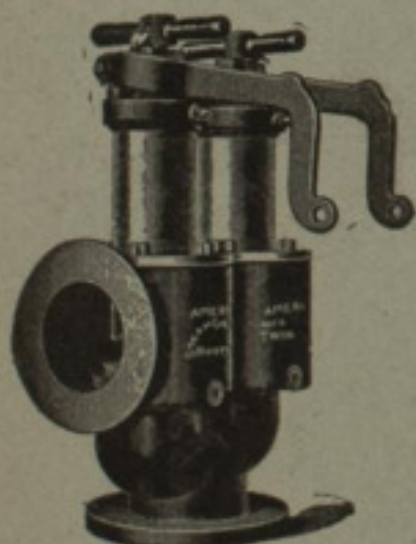
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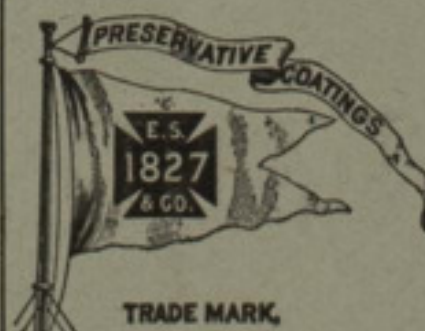
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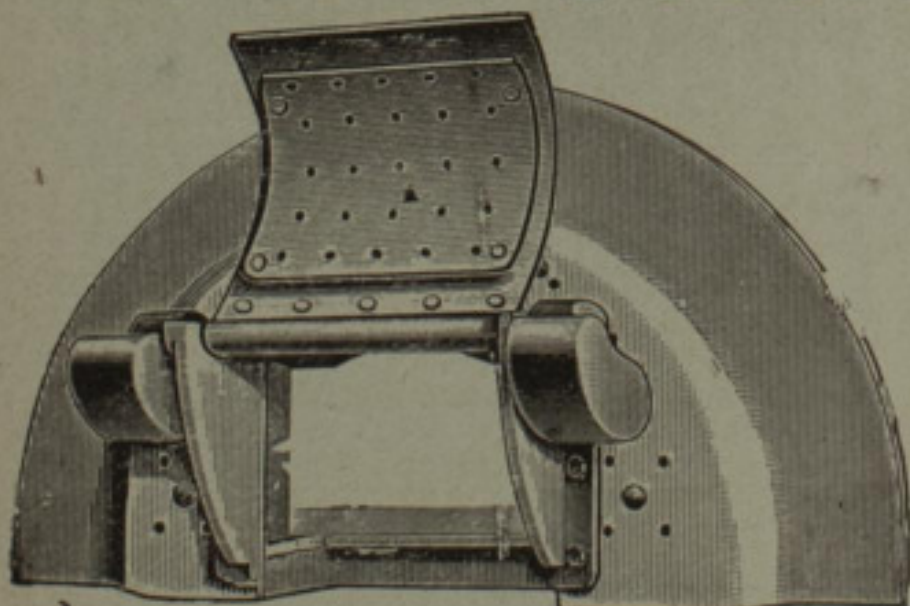
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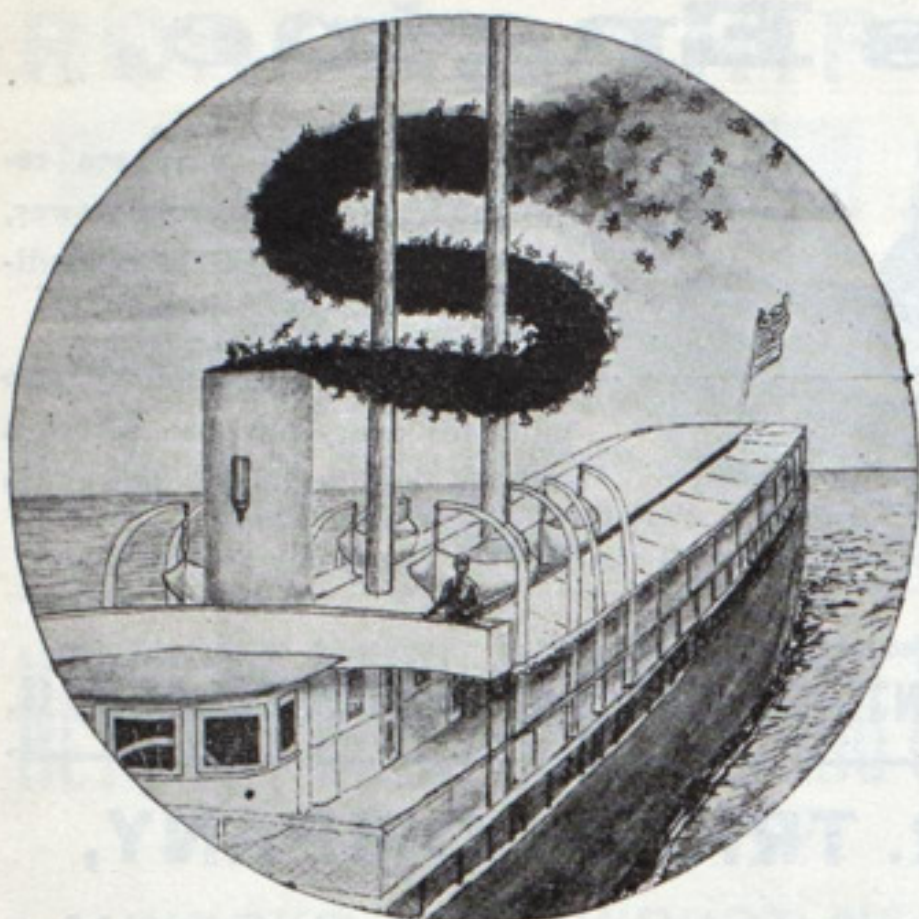
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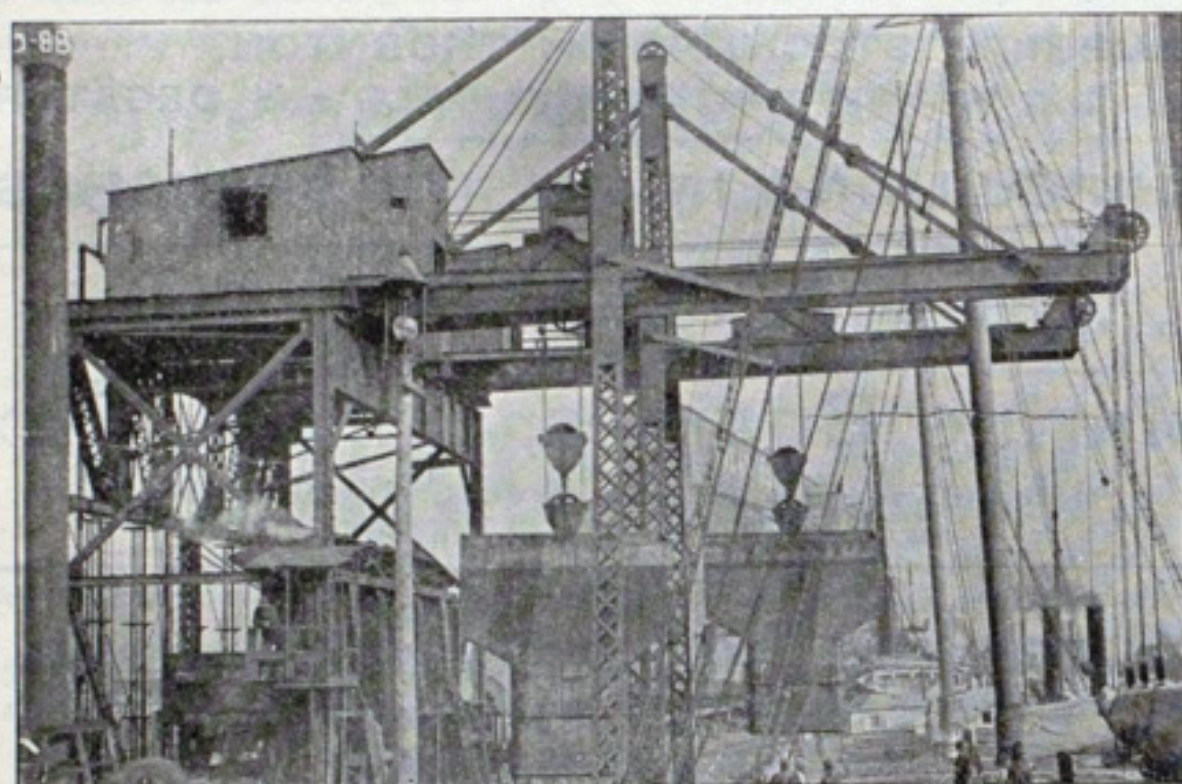
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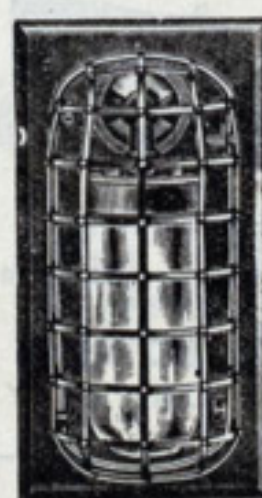
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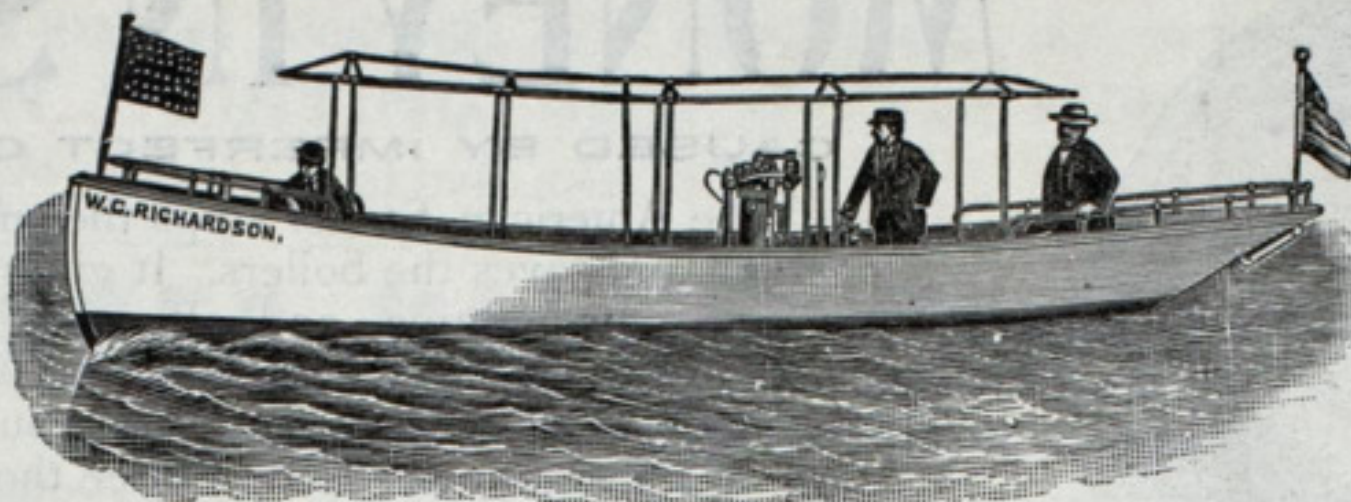
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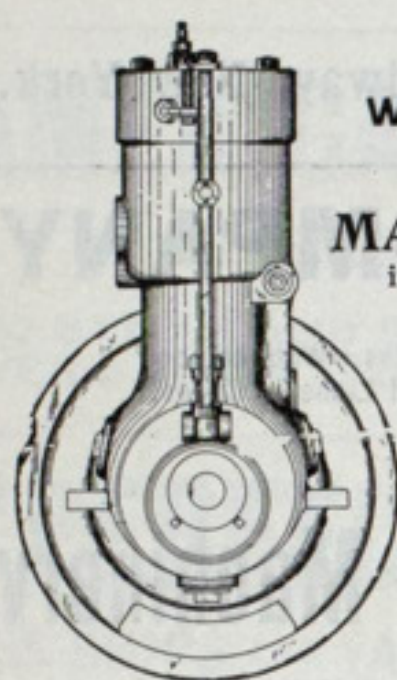
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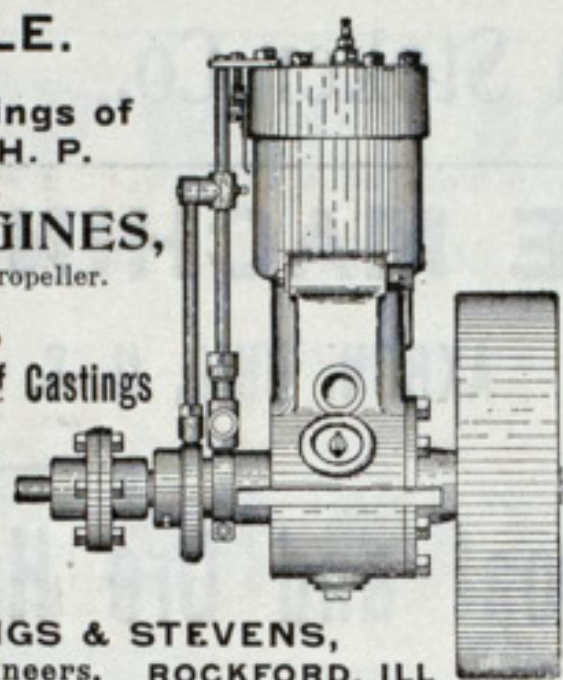
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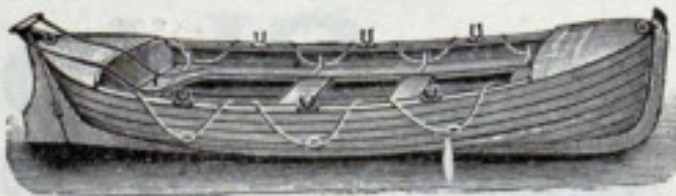
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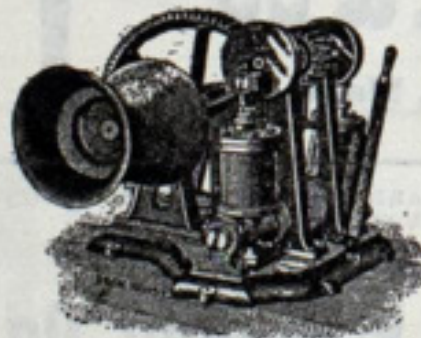


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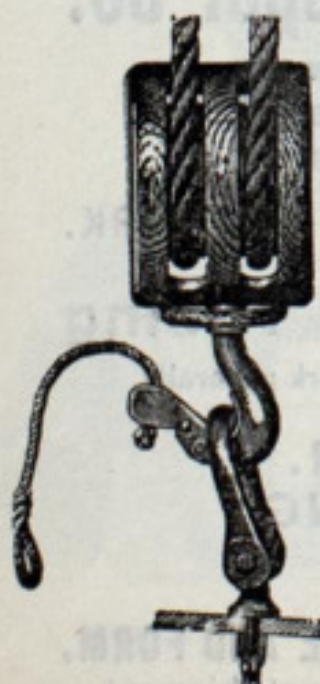
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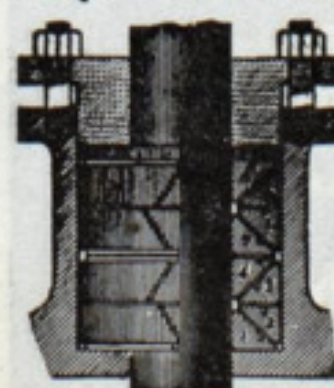
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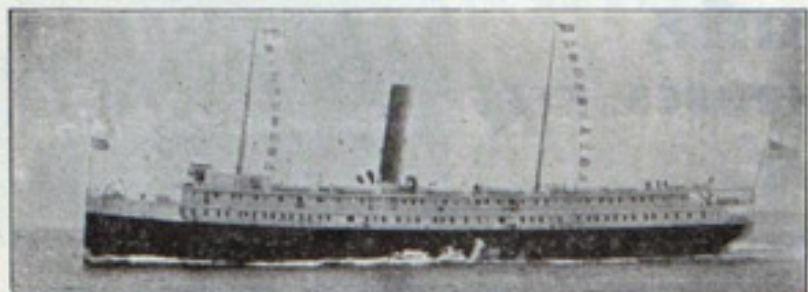
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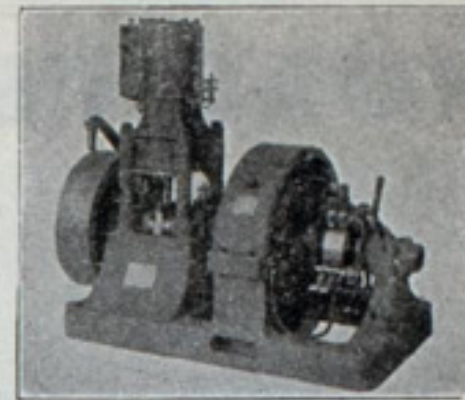
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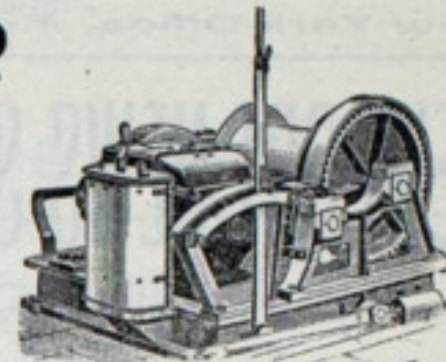
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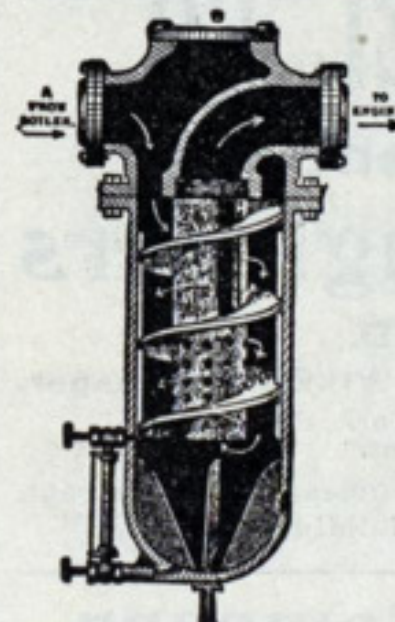
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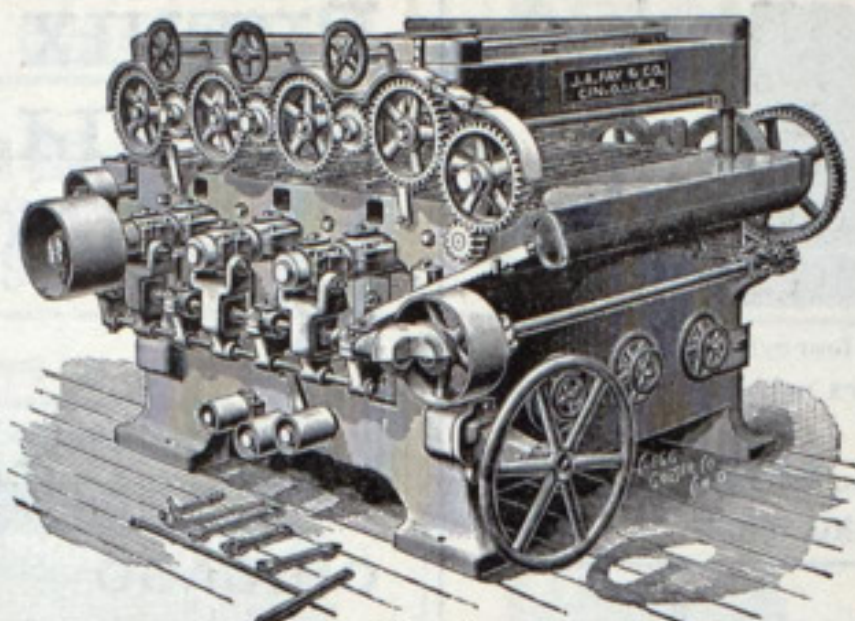
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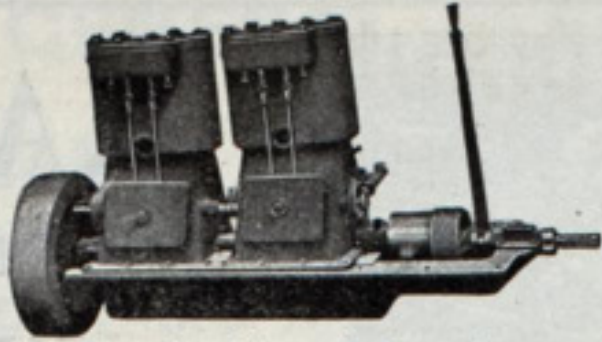
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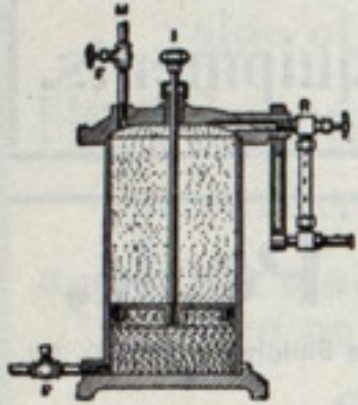
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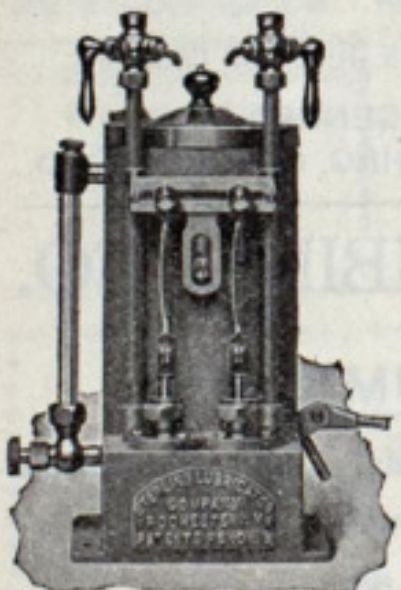
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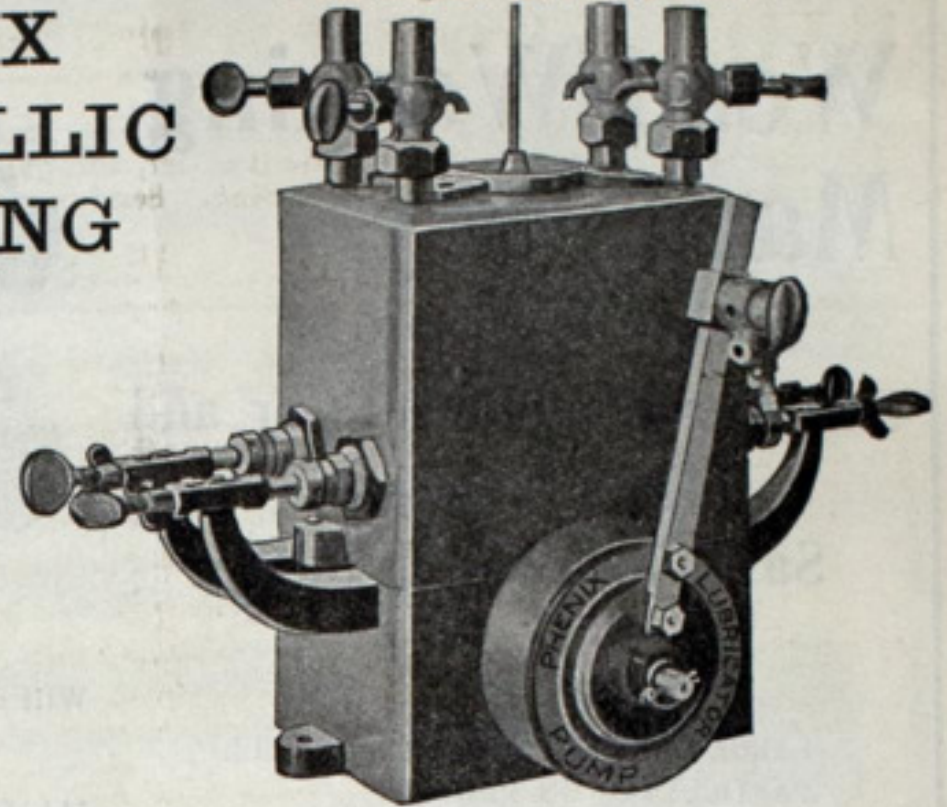
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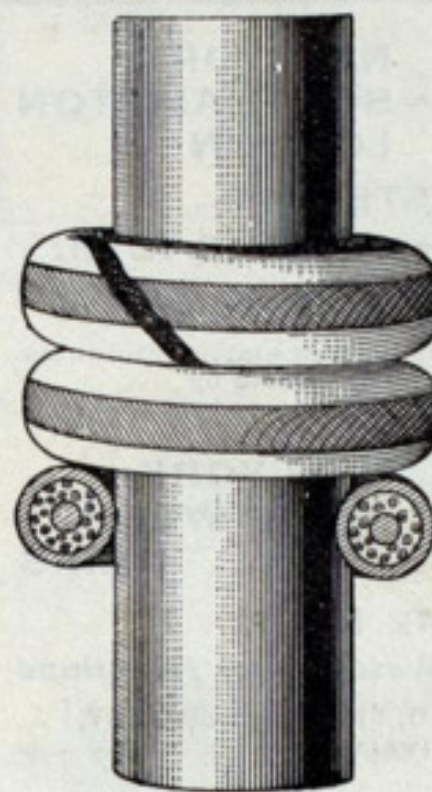
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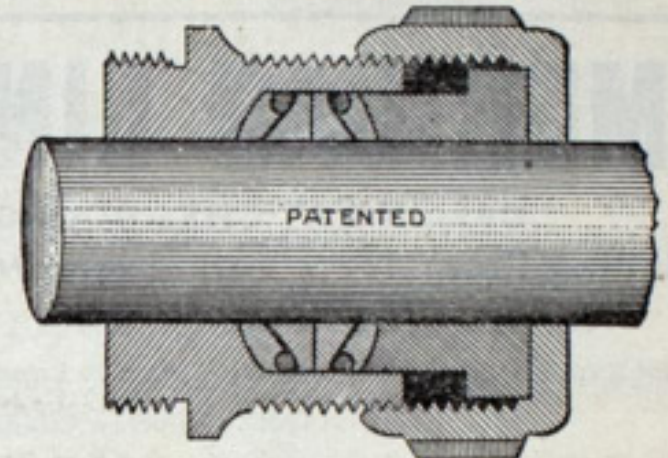
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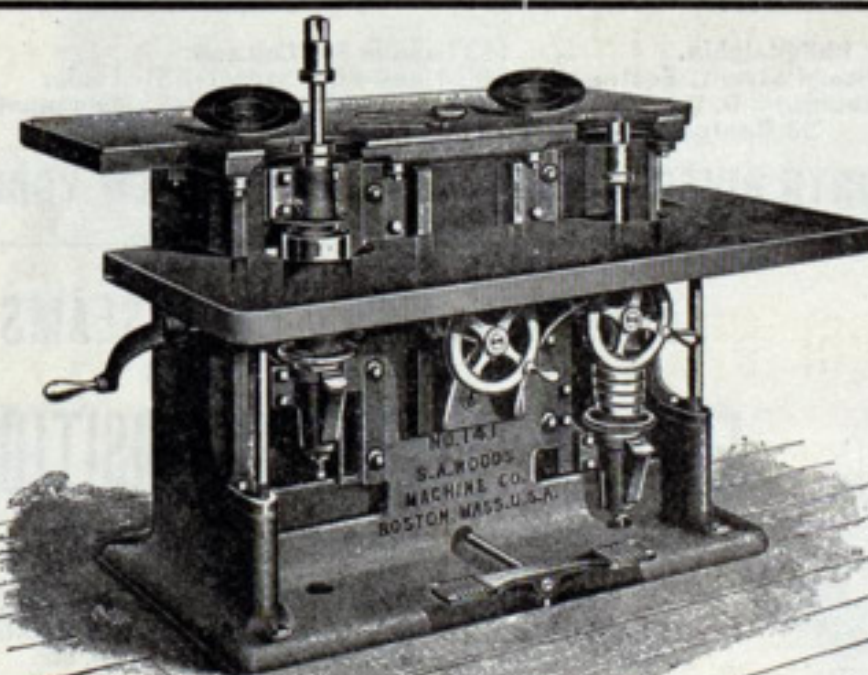
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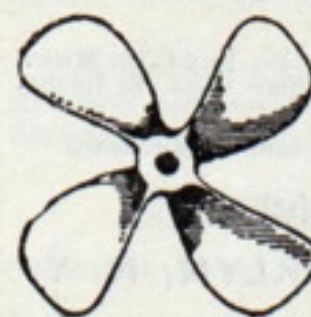
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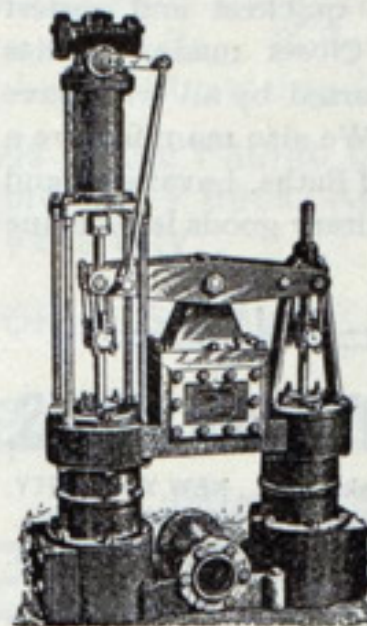
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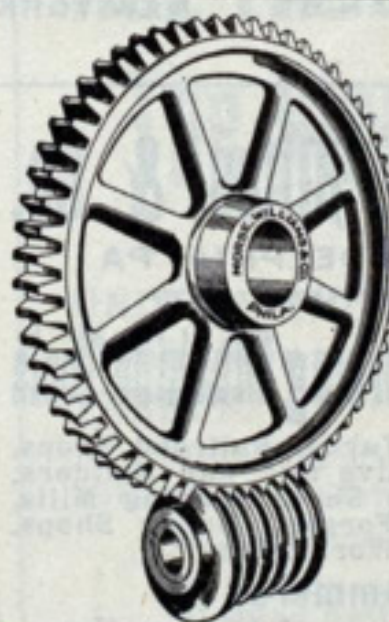
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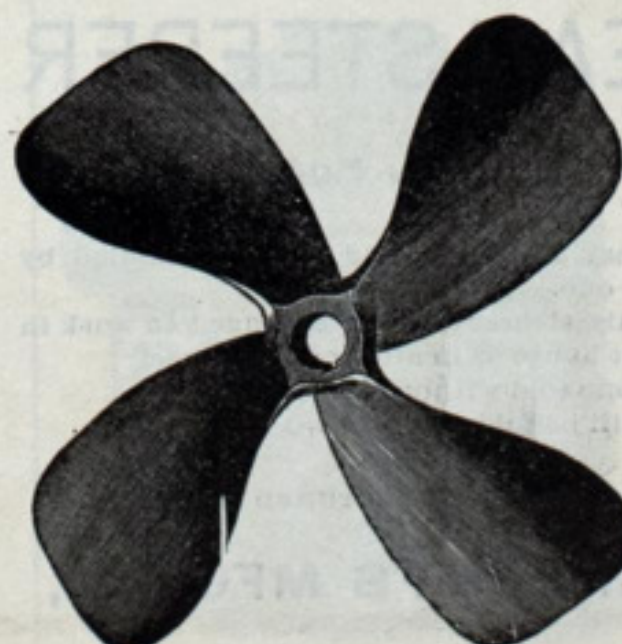
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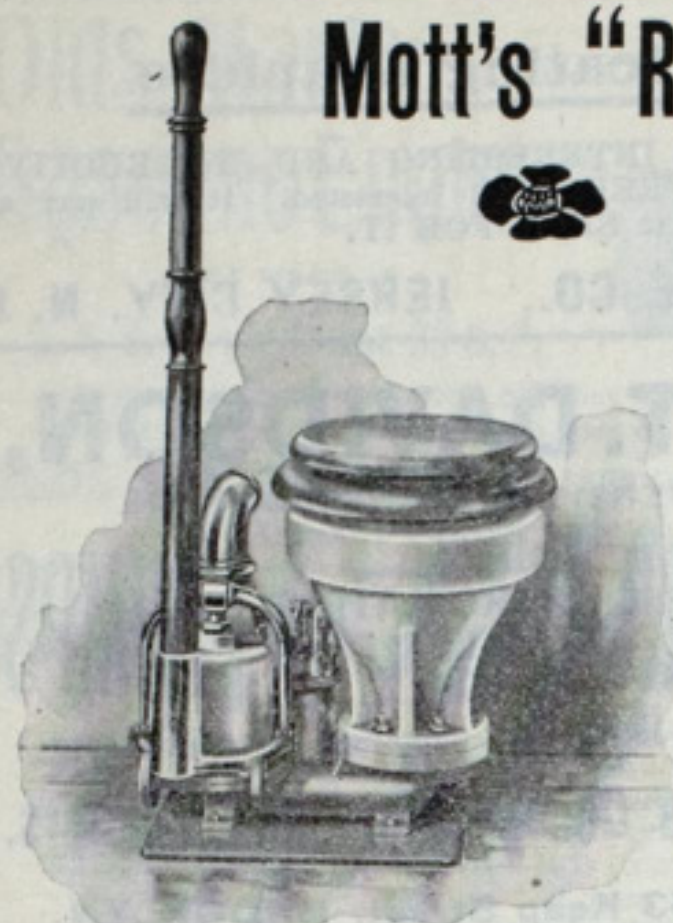
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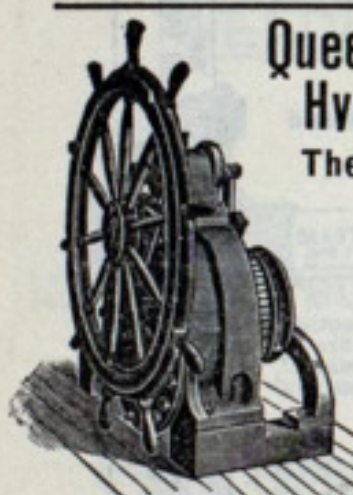
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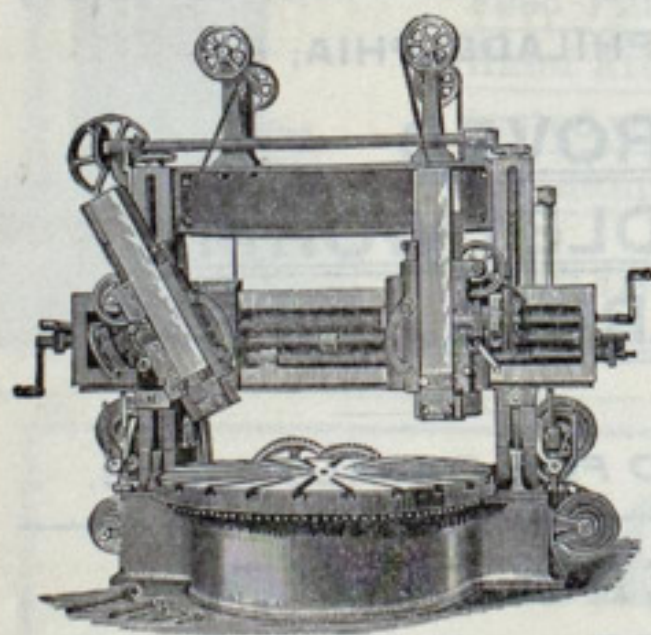
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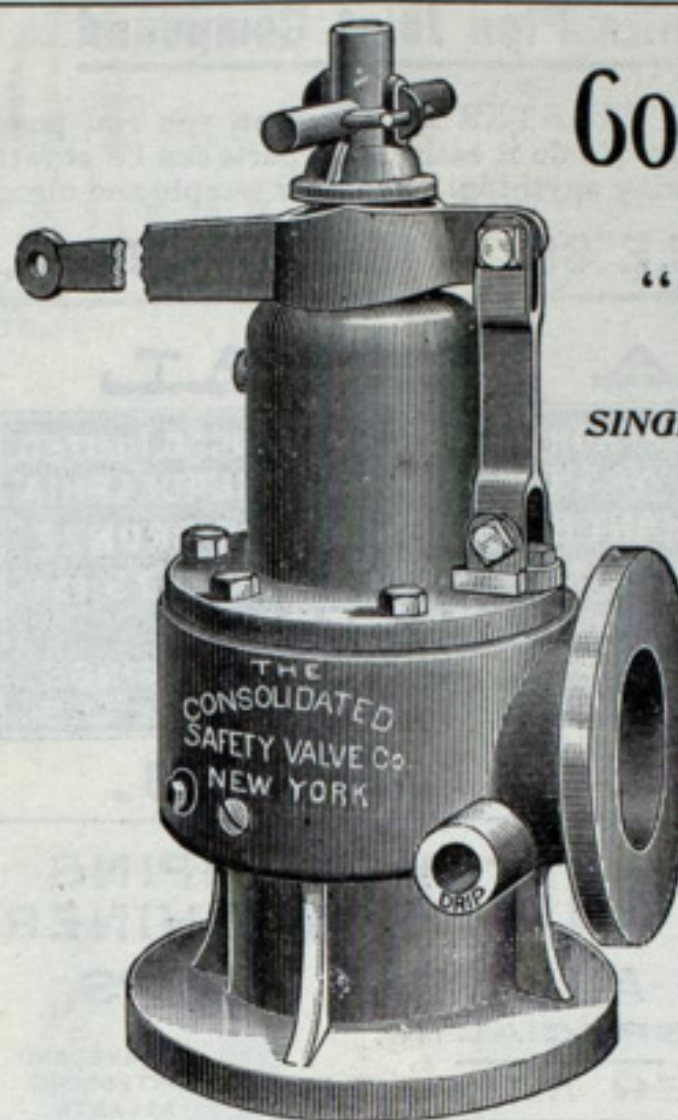
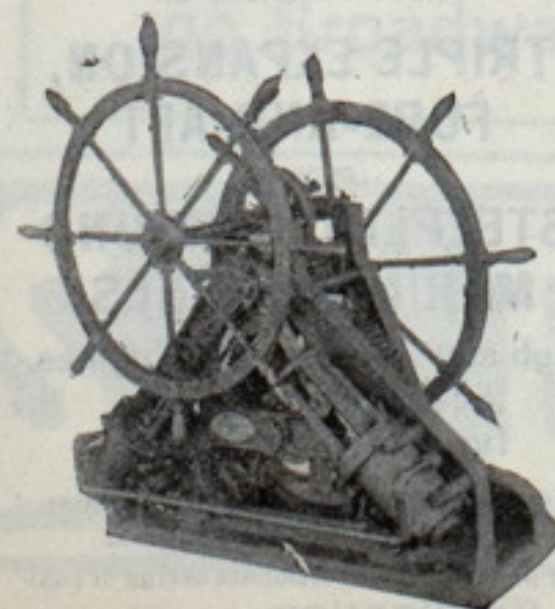
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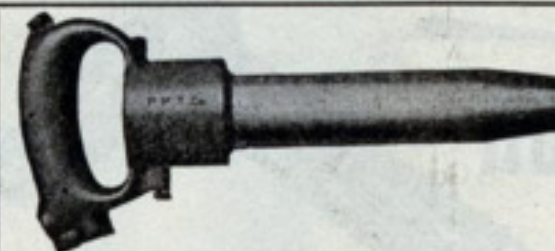
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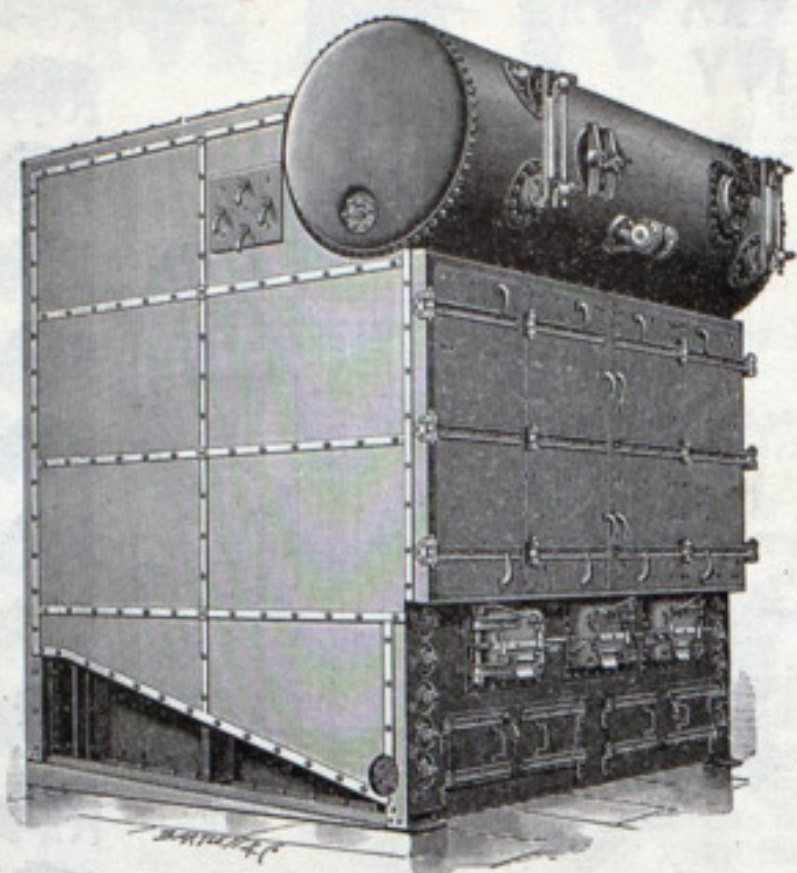
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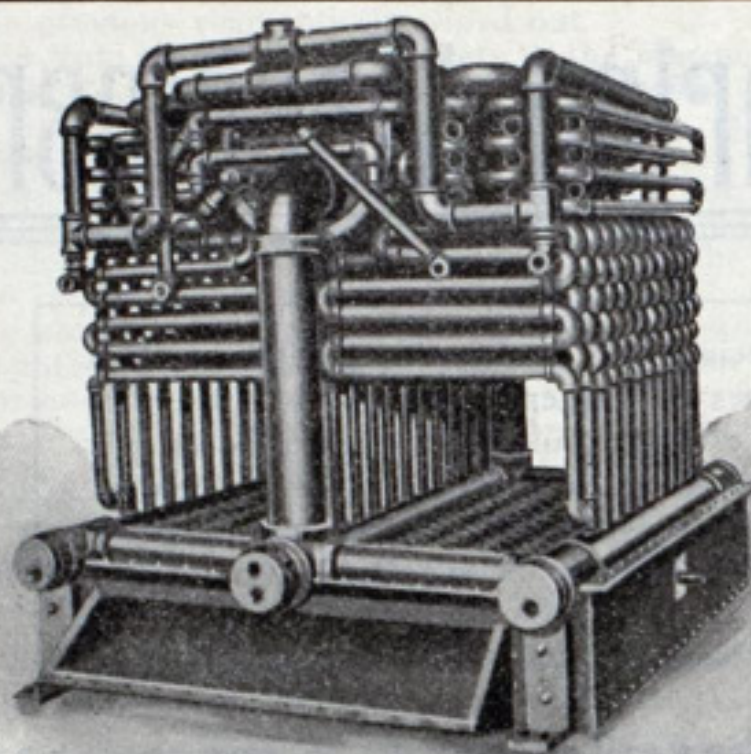
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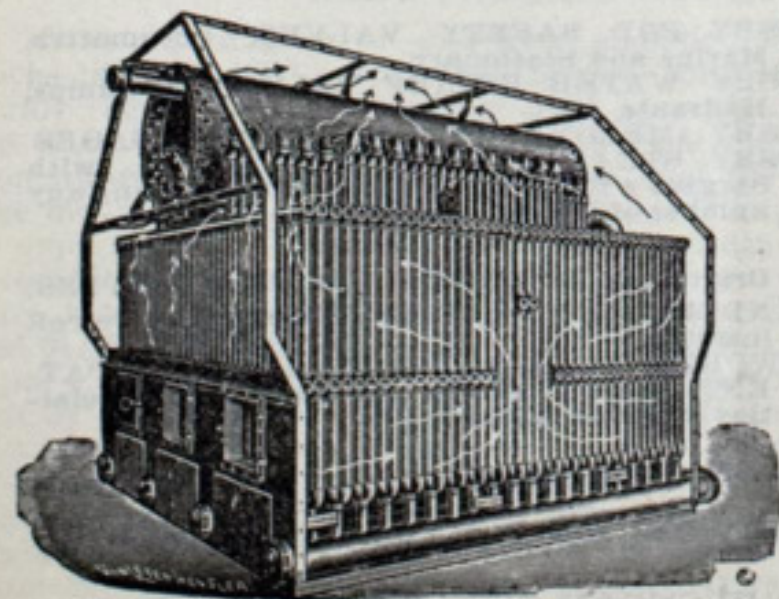
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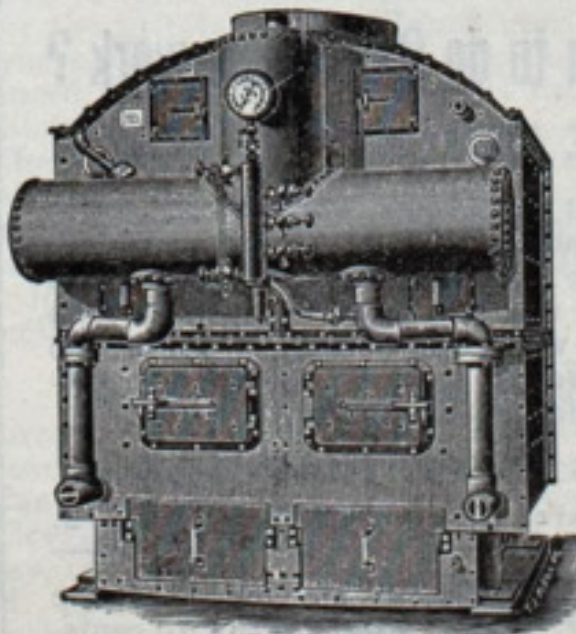
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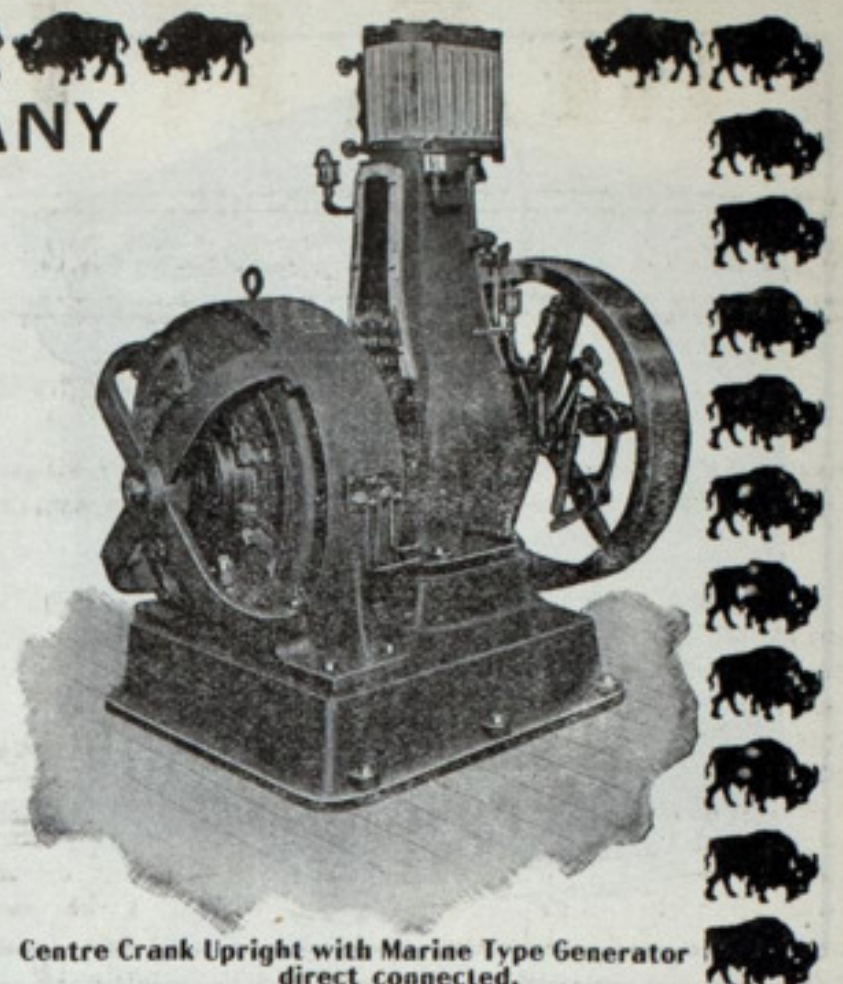
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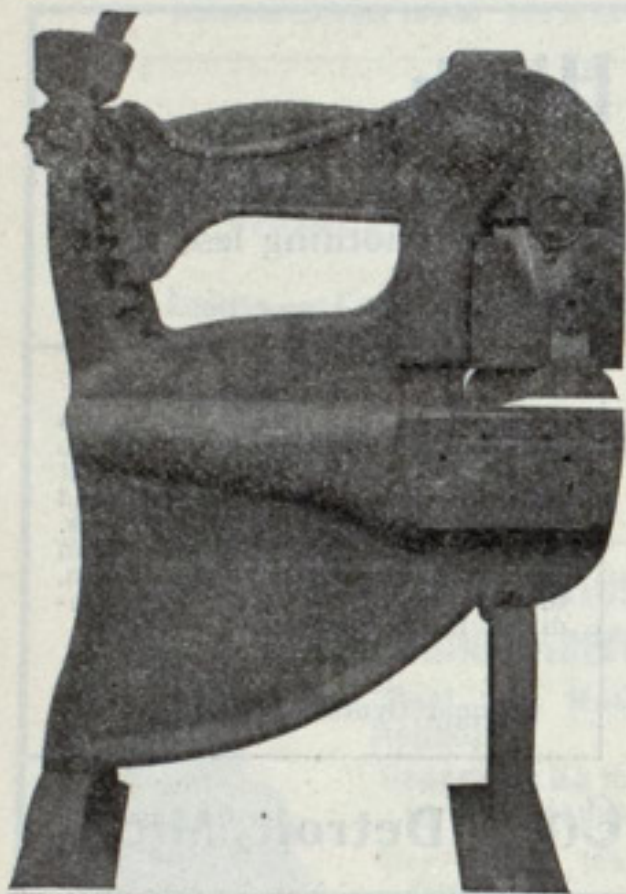
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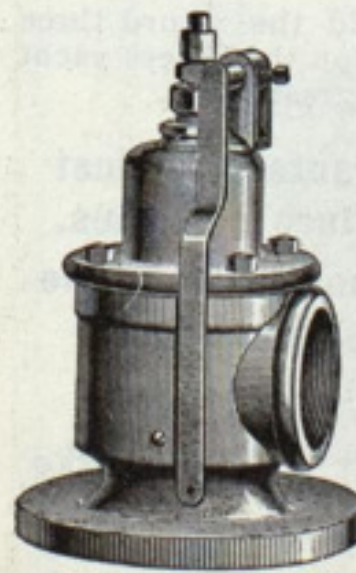
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